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Original Contributions.

USE OF THE SUMMER VACATION IN THE EDUCATION OF THE DENTAL STUDENT.

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When considering how many years a student should spend in professional studies it is proper to ask a few questions: Is the time commonly devoted to those studies fully utilized? How much of a so-called three-years' course is given to actual study and practical work and how much is allotted to vacations? Does a dental student need the time usually given to him for vacation? If he does not need the usual vacation period are the dental schools justified in granting it?

For the purpose of discussing these questions, let us take as a standard a professional course of three years with nine months of study in each year. In such a course there are twenty-seven months of study and six months of vacation, that is, between one-fifth and one-fourth of the time reserved for *education* is devoted to vacation. In this computation I do not count the small periods of vacation which occur at Christmas and Easter, but reckon only the long vacation of three months following the first nine months of study and the same following the second nine months of study.

I know of no physical necessity which requires that students from twenty to twenty-five years of age be allowed two-ninths of their time free from work. Suppose that these students were engaged in mercantile pursuits, their working hours would be longer and their vacations would not average over two weeks in the year or one-twenty-sixth of their working time. Or if the same students were engaged in the duties of a profession they would probably take no longer vacation than in mercantile life. Consequently, when students are allowed their present large per-

centage of vacation time it must be for reasons entirely apart from their physical well-being.

One reason I am convinced is long custom, but custom must be founded upon what at one time seemed rational. There has been handed down to us from past years the idea that students of all kinds must have long intervals during their terms, in order to pursue remunerative occupations and thus earn money enough to pay for tuition, as it was taken for granted that the average student was poor and was obliged to "work his way through." Another reason is the relief that the long vacations give to teachers, for if students work teachers must work, and when students play teachers can also play. So much for the reasons underlying this long-established custom.

Are we then to conduct the dental schools of the present day on the theory that students are too poor to pay their way through the required course without taking large intervals for money-making work, or are we to take it for granted that the teachers are unable or unwilling to furnish instruction for more than nine months at the most during the year? I believe that the time has come to abandon both of these suppositions; to part with the traditions handed down to us from the past, and to model the course of study without regard to the ease or comfort of student or teacher and make it fit the needs of the present time.

As to those needs, they have been expressed repeatedly during the last few years in the discussions of the National Association of Dental Faculties as to the question of adding a fourth year to the existing course. It has been said with a great deal of truth that when the average dental student graduates he has not had sufficient practical experience, and to remedy this defect the fourth year has been advocated, but are we justified in adding another until we have thoroughly utilized the three years? I say decidedly, no. It is a serious matter in this age of keen competition to deprive a man of one year of productive work, and it should not be done, even for purposes of study, unless clearly necessary. It cannot be held necessary until we have thoroughly utilized the time of the three-year course, but when this has been done, and the student is still deficient, it will then be desirable to add further time to the course.

There is, however, one other point to be taken into consideration, and that is the matter of preliminary requirements. The

more we require of students before they enter, the more progress they will make in a given time while in the school. It is conceivable that a student with a high preliminary education may accomplish as much in a three-year course as another man with low preliminary requirements would achieve in a four-year course, so I must make this as a complete statement: Increase the standard of preliminary requirements, utilize thoroughly the time of the present three-year course, and then be in a position to determine whether a fourth year is desirable or necessary.

But to revert to the subject of my paper, namely, the "Use of the Summer Vacation in the Education of the Dental Student"—what practical suggestions are to be offered? I can perhaps best express my views by outlining the summer work at the school with which I am connected. This does not at present fully meet my ideas as to the utilization of the summer vacation, but it represents a serious effort in this direction. A daily clinic is maintained for the extraction of teeth and the emergency treatment of mouth disorders during the long vacation as well as during both shorter ones. At this clinic students have an opportunity to operate under the direction of a competent instructor, and they can administer anesthetics and see them administered by others. During the summer vacation a weekly oral surgery clinic is held, at which students may see the common operations in oral surgery and have a chance to assist in same. A course is given in operative dentistry, which begins immediately after the close of the final examinations in June and lasts until August 1, so by this means an extra month and a half of operative work are offered to suitable students. A course in mechanical dentistry also is maintained for the same time. During the entire summer vacation cases of fractured jaws are treated by students under the direction of competent instructors.

All the summer work here described is entirely voluntary and is not a part of the required course, but to my mind the free utilization of the summer vacation would mean that courses in practical work should be not voluntary but required. I would reduce the summer vacation from three months to one month, and occupy the two months thus gained in operative education. In this way four months could be added to the three-year course of nine months, and the student strengthened along all practical lines.

IMPORTANCE OF SYSTEMATIC TRAINING IN OPERATIVE TECHNICS.

BY FRED W. GETHRO, D.D.S., CHICAGO. READ BEFORE THE SOUTH-WESTERN MICHIGAN DENTAL SOCIETY, AT KALAMAZOO, APRIL 11-12, 1905.

Following the request of your secretary for something along the line of operative technics, I will endeavor to briefly outline what seem to me the more important points in the technic course as given in the school with which I am connected. This subject is necessarily a very broad one, for it embraces the foundation work for the entire field of operative dentistry.

It may be of interest to know how and why this course was added to the curriculum of the dental schools. Fifteen years ago no college in the country had an adequate technic course, but since then it has become one of the most important subjects of the curriculum. Formerly it was expected that a student before entering a dental school had served under a preceptor for a period varying from six months to two years, and this was considered essential to his successful school training. In European countries it is still held the proper method to pursue. In this country we have long since arrived at the conclusion that it is not only unnecessary, but in most cases is detrimental to the best interests of the student. Ninety-five per cent of the students that have served a term in a dental office come to the college with an extremely exaggerated idea of their preceptor's methods, and they start the course with many positive beliefs as to just what they should do and what they should not. To disabuse their minds of some of these false ideas and get them in a receptive mood sometimes taxes the ingenuity and patience of a teacher.

I do not wish to be understood as casting reflections on any dentist who may have a student in his office, for there are many cases in which the student is benefited. It is rather a reflection of some serious difficulties which I have met in the handling of students. The following is but an example of how a student's mind may be prejudiced. After a lecture on the treatment of pulpless teeth one of the class said that he did not see why it was necessary to use rubber dam and antiseptics, because he had been with a dentist two years who always filled root canals without the dam, and allowed the saliva to bathe the canals, claiming that it was antiseptic.

Another student, when told he must sharpen the instrument with which he was cutting, replied that he thought the instruments were sharpened when they were purchased, adding that he had never seen the dentist he worked with sharpen one. I believe that a student can get a great deal from a course with a good preceptor, but the best time for that training is after his graduation.

The aim of the technic course is to give the student the consecutive detail work of the technical procedures of operative dentistry as a preparation for actual operations in the mouth. I do not mean that we should stick exclusively to technical procedures, but rather appeal to the student from the practical, and get him to knows the whys and wherefores. We must interest and enthuse him to get the best out of his efforts, and to do that we must be able to show him the benefits to be gained in his after-practice.

The first work that the student does in the technic laboratory, after gaining a knowledge of dental nomenclature and studying the superficial parts of the teeth, is the dissection of each tooth. He is required to make from three to five dissections of every tooth in the mouth, some being made lengthwise, exposing the pulp-chamber and root-canal or canals in their entire length, and others crosswise. This work familiarizes him with the several tissues of the teeth, namely, the enamel cap, the dentin and the cementum, and permits of a study of the pulp-chamber and root-canals.

The proper technic course should give first the finger-training, developing and strengthening the muscles of the fingers and teaching delicacy of manipulation. To demonstrate this development in the muscles of the fingers, I have brought with me the manudynamometer, an instrument designed by Dr. G. V. Black to measure the force an operator exerts with the several instrument grasps. In some experiments with our present freshman class I found a student who could not exert over five pounds pressure, and unless he develops strength rapidly he would better give up the study of dentistry, for he is sure to be a failure, as this lack of finger power will seriously handicap him in his operating. While we have never conducted enough experiments to state definitely the advance made in finger strength, I do know that there is a vast improvement made during the technic course. The average pressure of our students when they enter is almost ten pounds, and experiments conducted in the junior class show an average of thirteen pounds.

A very important point brought out in this technic training is the rest for one or more fingers, so as to prevent any accident caused by the slipping of the instrument or a sudden movement on the part of the patient. It makes no difference whether one is using a cutting instrument, explorer, scaler, plugger, burnisher, engine or knife, a positive rest must be secured. The man who attempts to operate without using a rest is sure at some time to do damage to his patient and himself.

There are two grasps used in most dental operations—one called the pen grasp, the instrument being held in the same manner as a pen, and the other the palm and thumb grasp. In the latter the instrument is placed in the palm of the hand and held firmly by all the fingers excepting the thumb, upon which it slides. In this case the thumb is also used as the rest finger. But this alone is not enough to prevent slipping. One of the most important features is a sharp instrument. A sharp instrument is not likely to slip, a dull one is almost sure to. In the case of the former little pressure is necessary to cause it to cut effectively; with the latter great pressure is necessary. It is this combination of dull instrument, heavy pressure, and no finger rest that causes fingers to be punctured, gum tissue to be lacerated, and in some instances parts of good tooth structure to be broken. How many cases do we have of torn rubber dam, caused from a cutting instrument slipping, a gold plugger slipping, or a bur in a rapidly-revolving engine running wild? These troublesome and sometimes disastrous accidents are not likely to occur with proper finger rests.

I feel that too much stress cannot be placed upon the sharpening of instruments, as it is simply impossible for a man to become a skillful operator unless he can keep a keen edge on his cutting instruments. Dr. Black was once asked what obtundent he used for sensitive dentin, and he replied, "A sharp instrument." Never were truer words spoken, for a sharp instrument will not only render the operation much less painful, but will shorten the time and do the work more effectively.

A good oil-stone is a necessity, and it should be of sufficient size and very hard. Many of our instruments are very small, and if we attempt to sharpen them on a soft stone we will ruin both. The care of the stone is of great importance. A new one should be soaked in oil and should be cleaned with oil on a cloth at the end of every day's use.

The study of instrumentation is a most important technic feature. We use Dr. Black's set of forty-four cutting instruments, and in order to familiarize the students with them, and the reason for their use, each one is required to make a full set in brass. By this means he is not only familiarized with the various forms, but it is noted that many students have trained the eye so accurately that at a glance at a given instrument they can detect a variation in the width of the blade one-tenth of a millimeter, which is about 1-250 of an inch.

The metric system is used exclusively in all the work during the entire college course. Each student is required to have a steel millimeter gauge that will measure accurately to one-tenth of a millimeter, and he uses this instrument constantly throughout the course. Instruments or burs are never spoken of as large, medium or small—each has a definite formula which is used in all the teaching and which is necessary for accuracy. It is not possible for a teacher to tell a class to use a small hatchet or bur for a certain purpose, or a medium-sized spoon for another, and convey anything like an accurate impression. A carpenter would not speak of a small auger—he would say a 3-16 auger or a 5-8 auger. What seems small to one may seem large to another. I hope the time is not far off when the entire dental profession will adopt and use this metric system, for it will prove invaluable in our dental societies, as the papers and discussions will be much more accurate and beneficial.

The blade of every cutting instrument has three measurements—the first is the width at the cutting edge and is given in tenths of a millimeter, the second is the length of the blade and is given in millimeters, and the third is the angle of the blade with the shaft or handle and is given in centigrade or hundredths of a circle. When a student is told to cut a groove in a cavity with hoe 6-2-6, he can make no mistake as to the size of the instrument to be used or the width of the groove to be made. If he is told to make a pit with an inverted cone bur 5-10 of a millimeter, measurements for burs always referring to the diameter, he knows exactly the size to use.

Every student carves in ivory six teeth, duplicating six typical models selected from extracted teeth. It is required that he duplicate the root portion with the same accuracy that he duplicates the crown. No carving is accepted unless accompanied by the

natural tooth used as a model for means of comparison. This carving is valuable in proportion to the accuracy with which it is executed. This work serves the double purpose of giving him technical skill with his cutting instruments and teaching him external dental anatomy by a method more effective than any other. The carving of teeth is undoubtedly the most difficult technical work required of the student during his entire course, but the result is well worth the effort. The instruments used for carving are the same set of forty-four that he uses for all his technic work in his freshman year, and for his operating in his junior and senior years and in his after-practice.

Let me give you an illustration of the benefits of this carving. After the student has carved a mesio-buccal root of an upper first molar he is well aware that as it leaves the crown portion it inclines to the mesial and buccal and then to the distal. Note of what assistance it is to him when he comes to treat this same root in the mouth, as he has definite knowledge of just how his broach should be bent to correspond with the various inclinations of the root. By no other method with which I am familiar could he gain such exact knowledge of these minute details. The effort in this carving is to develop the idea of contour of the teeth. How often do we see gold fillings in the anterior part of the mouth that are conspicuous and offend our ideas of the esthetic? Had the fillings been properly contoured in many of these cases the result would have been much less conspicuous and in some cases hardly noticeable, as harmony of contour does much to overcome lack of harmony of color. The same is true of porcelain or any other material used to reproduce lost tooth structure. If we are to replace teeth or parts of teeth and conceal our art, we must gain a minute detail knowledge of dental anatomy. One could write pages on the many benefits gained from this carving.

Treatment of Teeth.—No subject in operative dentistry needs more careful and conscientious technical study than the treatment of teeth, and I am of the opinion that the profession as a whole is not obtaining as good results as it should. There are several reasons for this, and possibly the one that appeals with equal force to both patient and operator is financial. In our colleges no charge is made for the student's work time, and this in itself is right, as a charge is imposed only where material is used, but

I believe that this is the starting point of this wrong idea. The student gains the impression that treatments bring him little or no remuneration, and that it is the filling or crown which will financially reward him. Again, the average patient does not expect to pay much for the treatment of a tooth, if the same dentist places the filling or crown.

We are to blame for this condition, for we have educated the people into this way of thinking. A charge should be made for every treatment, and the patient should be made to understand that he is paying for each appointment, regardless of what we may do. A dentist should not make the same charge for a crown where the tooth has been treated and root filled that he would for one where he has to treat the tooth. A separate charge should be made for each treatment. Students should be impressed with the fact that to successfully treat teeth requires a higher development of technic than does the successful insertion of fillings or the placing of crowns.

As an object lesson in root-filling every student files away the mesial and buccal root-canals of upper first molars, and the mesial roots of a lower first molar in which the canals have been filled previously. This filing exposes the canal in its entire length. It is unnecessary to add that in some cases imperfectly filled canals and occasionally a piece of broken broach are discovered. This optical demonstration causes the student to think more seriously about this subject of root-filling.

At this time the study of cavity preparation is taken up, and at the same time the students begin to prepare cavities in natural extracted teeth, bone and in carved ivory teeth. In this technic course the student is not taught the pathology of decay, but he is taught to observe the physical characteristics of decay. Great stress is placed on the instrumentation of cavity preparation, and the aim is to teach the student to think in instrument form. This is the great time-saver in the preparation of cavities, as few instruments are necessary for the preparation of a given cavity. To demonstrate the instrumentation of cavity preparation a number of large models of teeth are employed, with a set of instruments which are duplicates of the cutting ones used by the students. These instruments are made on a scale of fifteen diameters and can be readily seen from any part of the lecture room.

All cavity preparation must be carried through with a definite order of procedure, and each step is completed before progressing to the next. The first step is outline form and includes the preparation of the walls of the entire outline of the cavity. The second step is resistance form and consists mainly of a flat wall or base and is usually at right angles to the stress of the filling. The third step is retention form. The fourth step is convenience form. The fifth step is to remove any decayed dentin. The sixth step is to smooth the walls, bevel the cavo-surface angle, and make the final preparation or toilet the cavity. This order of cavity preparation, as well as other technic teaching, is begun in the freshman and continued in the junior and senior years. It is this continued uniformity of instruction that eventually teaches the student to do things with a definite system.

SUSCEPTIBILITY AND IMMUNITY TO DENTAL CARIES.

BY J. SIM WALLACE, D. SC., M. D., L. D. S., LONDON, ENG.

I do not know the chronological sequence of the several theories which have been advanced to account for the prevalence of dental caries among civilized people, but two to which I would refer probably existed before we did, and although these two theories are supposed to have been completely exploded and practically expunged from dental literature, they yet contain some truth which all our scientific knowledge has scarcely improved upon. I refer to the idea that sugar is harmful to the teeth, and to the less popular but possibly equally old idea that the refined foods of civilized man are responsible for the prevalence of the disease. These popular notions were vague, and the question of *how* such causes acted was not apparently settled. There were not many important investigations undertaken to decide the point, but a few of first-rate merit which have had great influence must be referred to.

The first which I would mention was that undertaken by Mummery. This has been a standard monograph, and was "meant to establish the relation of caries to the healthy or unhealthy manner of life of a given race." Much as I admire Mummery's investigation, I am bound to say that it tended to divert

further search from a dietetic cause. The most that could be said as regards foods was that meat-eating races appeared to be rather less susceptible than others, and this even could be seen only on careful analysis of the tabulated results, and the fact was by no means a marked one. Unfortunately this investigation opened up the way for the idea that susceptibility to caries was not brought about as much by food as by general constitutional and hygienic conditions.

Although Mummery's investigation made it seem quite improbable that the nature of the food would give a clue to the complete solution of the problem, yet the idea that the teeth were perhaps insufficiently nourished, either through hygienic conditions, constitutional states or improper feeding, still held ground and appeared to support the assumption that the teeth were deteriorating. Moreover, the unfortunate belief in the inheritance of acquired characters seemed to further enforce this idea, and the constitutional degeneration of the teeth was considered an unquestionable fact.

It naturally followed that when Dr. Black published his investigation on the "Physical Characters of the Teeth in Relation to Their Diseases," especially when he revealed the fact that differences in the density or in the percentage of lime salts have no influence as to their liability to caries, he seemed to completely stagger the dental world. Two courses only seemed possible, either to deny the truth of Black's observations or to assume that the hereditary and constitutional influences which induced caries were outside the tooth structure itself. Many adopted the former course, and considered that there were differences in the molecular arrangement of the lime salts, or that Black's experiments "failed to differentiate clearly between water of composition—i. e., the degree of chemical hydration of the calcoglobulin and water of structure, that taken up by simple inbibition." Dr. Black naturally respected his own experiments, and tried to explain the susceptibility to caries in constitutional states which alter the secretions of the mouth. He considered that the hereditary nature of the disease was so obvious that no one would venture to suggest the opposite. Therefore, when a few years later he published his paper on "Susceptibility and Immunity to Dental Caries," it was very natural that the dietetic factor should be completely ignored. He, like

other writers, had completely expunged the idea that an investigation of the nature of the foods could by any possibility explain the known facts, or rather the facts which were assumed to be indisputable.

Meanwhile the advance of bacteriology and the important investigations of Dr. Miller had established definitely the exact nature of caries. Miller's work seemed to lend some support to the popular idea that sugar was harmful to the teeth, but unfortunately he confined his considerations almost wholly to the chemical differences in food, and thus such well-known facts as, for example, that native children who consume large quantities of sugar from sugar cane seemed to remain a proof that this was not a cause of the prevalence of caries of any consequence. Miller also records experiments indicating variable susceptibility of different teeth to the action of acid, just as ordinary table salt is more easily dissolved than rock salt, thus appearing to confirm the hypothesis that there is a molecular difference in the constitution of teeth, which would explain more or less varying susceptibility. He also indicates his adherence to the idea that acquired characters may be transmitted (Microorganisms of the Mouth), and in the hereditary predisposition to the disease, although if I am not mistaken he places less importance on the hereditary and constitutional nature of the disease than do other authorities.

Next to erroneous beliefs with regard to heredity the idea which has been most potent in preventing the solution of the question of susceptibility and immunity is the discovery of the direct or exciting cause of caries, namely, acids and microorganisms, for immediately this was demonstrated it was but natural to think that immunity would be secured by the more or less complete destruction of the germs. Under the sway of this theory antiseptic mouth washes, tooth soaps and tooth powders have been introduced, and elaborate investigations made of the antiseptics which are most powerful in destroying the microorganisms of the mouth, while bactericidal properties have been searched for in every possible constituent of the saliva or of the secretions which are poured into the mouth. How thoroughly past research has diverted investigators from any guidance in the search for the cause of immunity may be gathered from Dr. Miller's recent communications and negative results. I do not mean to depreciate the ex-

cellent work of the authors to which I have referred, but only to point out that together with the good there was always in my opinion something which prevented thought and investigation from settling on the true solution of susceptibility and immunity.

On quite different lines knowledge was accumulating, which I believe points in other and more profitable directions. The Neo-Darwinians had shown that acquired characters were not transmitted, and thus to them the idea of the hereditary degeneracy of teeth collapsed. Those who adopted this Neo-Darwinian view saw at once that Black's investigation into the calcification of teeth only confirmed their deductions, and I at least saw no reason for the prevalent carping criticisms and the attempt at molecular disintegration of the facts which he brought to light. Further deductions from the belief that acquired characters are not transmitted lead me to ignore the assumption that "hereditary predisposition to caries is the first importance" (Black, *Cosmos,* Sept., 1899).

Notwithstanding the tide of opinion among dental surgeons and the weight of authority which supported it, I came to the conclusion that we had been drifting in the wrong direction, and that a dietetic solution of the problem was the only one possible. After more or less prolonged investigation I ventured to make the generalization that "the cause of the prevalence of dental caries is that the natural food stuffs are to a large extent ridded of their accompanying fibrous parts, and prepared and consumed in a manner which renders them liable to lodge and undergo acid fermentation in the mouth; while from the same cause and the induced conditions the microorganisms of the mouth lodge and multiply and augment the rapidity and intensity of the acid fermentation." I further even affirmed "that under proper dietetic conditions the bacteria of the mouth are valuable agents in the preservation of the teeth." It could hardly be expected that views such as these would be readily accepted at the time they were first published, but they have now met with so much approval and criticism that further amplification and justification of the theory seem to be called for. Moreover, the generalization gives the key not only to susceptibility and immunity in general, but also even to the relative susceptibility and immunity of individual teeth.

A subject of great importance in the investigation of this

problem is the physiology of mastication, and here again I must insist on an abandonment of current beliefs. The process of mastication is not as described in books on physiology. Take, for example, the description given in the text-book usually read by dental students. It runs—"When solid food is taken into the mouth it is cut and ground by the teeth, the fragments which ooze out upon the outer side of their crowns being pushed beneath them again by the muscular contractions of the cheeks and lips; while those that escape on the inner side are thrust back by the tongue, until the whole is thoroughly rubbed down. . . . When the food is sufficiently ground it is collected, enveloped in saliva, into a mass or bolus which rests upon the back of the tongue, and is carried backwards to the aperture which leads into the pharynx." It will be observed that this description would lead one to think that the food is comminuted, mixed with saliva, made into bolus form and then swallowed. It seems difficult to believe that such an erroneous description should have been written by Huxley, and equally hard to conceive why no one has had the courage to call its accuracy in question, for anyone can observe for himself at each and every meal that the description of the process is quite inaccurate.

Before describing the operation, however, when it is thoroughly performed, it should be noted that certain foodstuffs which are consumed at the present day are hardly subjected to mastication at all. The food is simply taken into the mouth, receives a general squash between the teeth or between the dorsum of the tongue and the hard palate, and is then swallowed. This method of mastication—if mastication it can be called—is as a rule adopted for custards, fine-meal porridge, soft puddings and soft non-fibrous foods generally. When there is a certain amount of coarse or fibrous matter in the foodstuff the process is essentially different and mastication is performed in a more thorough manner. In this case the food is crushed and torn between and heaped on to the masticating surfaces of the teeth by the muscular contractions of the tongue, cheeks and lips and the motions of the lower jaw. During comminution between the teeth the juices of the foodstuffs, the saliva which becomes incorporated and the suspended non-fibrous part are pressed out from the fibers and gradually collect on the middle of the dorsum of the tongue, which is gradu-

ally hollowed out for the reception of such food, and this part is then swallowed. The fibrous part of the food, however, is subjected again and again to the crushing and disintegration between the teeth, and if any of it passes towards the back of the dorsum of the tongue, it is arrested by the pressure of the anterior part of the tongue against the rugæ of the palate, and while the fluid and finely comminuted part is sucked or pressed back into the hollow formed at the back of the dorsum of the tongue, the coarse and fibrous parts are thrown between the teeth and subjected again and again to the crushing, squeezing and comminution. The rough surface of the tip and dorsum of the tongue and the smooth-ridged palate are especially well adapted for this separation of the food prepared for swallowing and that which requires further mastication. When a child is brought up on foods of a consistency demanding real mastication it acquires the habit of masticating, whereas pap-fed children do not get it so thoroughly.

Leaving aside other considerations which tend to make certain people masticate efficiently, it should be observed that the act of mastication is most important in the natural self-cleansing of the mouth. For when it is efficiently performed the ptyalin is thoroughly incorporated with the food, and converts the starch into a soluble form, which becomes expressed from the bolus and swallowed; or if a little lodges about the teeth the constant rushing of the saliva between and about them tends to dislodge or dissolve any that might otherwise lodge and undergo acid fermentation. Thus with efficient mastication it is not only the exposed surfaces of the teeth which the saliva helps to clean, but even the most inaccessible crevices. It should be remembered, too, that the mastication of food which demands considerable muscular activity calls forth a corresponding flow of saliva, and no doubt the continued use of food causing a healthy flow of saliva tends to develop the salivary glands. Thus again those who habitually consume food stimulating the flow of saliva are both directly and indirectly less susceptible to dental caries.

Another general effect of coarse food and efficient mastication is to wear the cusps of the teeth so that the crevices become small or obliterated, and consequently the susceptibility for food to lodge is lessened.

The modern refinement and preparation of food make particles which lodge about the teeth peculiarly unirritating. If the food is highly refined and soft it may be plastered into the crevices of and between the teeth after meals, without stimulating saliva or exciting the tongue to dislodge it, but if, for example, nuts are consumed, there is something in their physical nature which makes one very conscious of their presence and stimulates not only the flow of saliva, but also the motions of the tongue and cheeks until they ultimately are dislodged.

So also the modern preparation of food tends to deprive it of the natural fresh acids which would otherwise almost invariably accompany vegetable foods. Thus it correspondingly happens that the saliva is not so fully stimulated as it should be, for when acid is taken into the mouth not only is the saliva stimulated directly, but the acid which reaches the stomach stimulates the flow of saliva also. At least I notice a much more copious flow of saliva after eating, for example, stewed apples, than after eating some bland neutral or alkaline pudding. The importance of what we may call the after-flow of saliva can hardly be doubted, for the frequent swallowing which it causes after meals is a most potent factor in the self-cleansing of the mouth.

Before proceeding further it may be advisable to draw attention to some facts with regard to the secretion of saliva. In general it should be remembered that the work of the salivary glands is capable of adapting itself to certain conditions, that is to say, it bears a definite relationship to the requirements, which must be fulfilled by the saliva produced. "It is of importance to bear this in mind, for as things are usually taught at present one is led to suppose that the work of the salivary glands is of no import and that they respond in haphazard fashion to every form of stimulus" (Pawlow and Thomson).

The general relation of the saliva to the nature of the food and to the self-cleansing of the mouth may first be indicated by the following observations. If some sand is thrown into a dog's mouth "the saliva flows in quantities, because sand cannot otherwise be removed than by a free stream of fluid. Upon all substances which the dog rejects, for example, acids, salts, bitter and caustic things, saliva will likewise be found, because these required to be neutralized, diluted or washed out of the buccal

cavity. This explanation is fully confirmed by the absolutely constant and striking fact that a thin watery saliva, containing mere traces of mucin, is poured out by the mucous and salivary glands upon every substance without exception which requires to be removed, while upon eatable articles a slimy mucin-holding fluid is secreted which lubricates the food bolus and facilitates its descent through the esophagus. Further, the quantity of saliva secreted is closely related to the dryness of the food, and the drier this is the more saliva flows—a striking proof that the first of the digestive glands adapts itself to the physical conditions of the food" (Ibid).

I shall now refer to an observation which can scarcely be doubted, namely, that on the whole people who eat but three meals daily are less susceptible to caries than those who eat a greater number. The explanation of this is I believe as follows—when only three meals are consumed the stomach generally is allowed to empty itself before another meal is taken, so that the process of digestion goes on normally. During the consumption of one of these meals there is a considerable flow of saliva, for the appetite tends to be keen and the secretion fairly abundant. After the meal is finished the after-flow of saliva continues for a time, but gradually decreases as the acid secreted by the stomach increases. Suppose on the other hand that four or five meals are taken, then the stimulation of the flow of saliva is unduly divided and the amount secreted during and immediately after a meal is less than when only three meals are consumed. Furthermore, if the amount of saliva is less both during and after the meal, then the self-cleansing of the mouth by this means is correspondingly less. If, as is the case with cooks and confectioners, the place of vigorous stimulation of the salivary glands is taken by repeated little stimuli, then the results are even worse. Moreover, of course, if a little food tends to lodge after each meal, should six meals be taken instead of three there will, other things being equal, be twice the susceptibility to the results which follow the lodging of food.

Another thing which influences the susceptibility to dental caries is the time taken over a meal. Thus if a meal is begun, continued and ended without intervals or without unnecessary waste of time, the likelihood of harm resulting to the teeth is not so great as is

usually the case. When we consider, too, the general question of the physiology of digestion it is evident that spending a long time, say more than half-an-hour, over a meal is in no way conducive to the digestion of the latter portions of it, nor can we expect that the after-flow of saliva will be considerable after a long-drawn-out meal.

Let us now direct attention to the method of the self-cleansing process. If the food has been of such a nature that real or thorough mastication has been called forth, then of necessity any particles of food that do lodge will be well incorporated with saliva, and as the ptyalin does not exhaust itself appreciably the process of the conversion of starch into a soluble form will continue so long as the starch remains. The after-flow of saliva from the parotid passes round the buccal sides of the teeth, and is sucked in between them each time the act of deglutition occurs, so any food particles tend to be dislodged and swallowed. With some people the mouth seems to become callous and the particles of highly refined food do not materially stimulate this self-cleansing process, but with others the case is different, and after meals they may be observed swallowing frequently, and may unfortunately sometimes be heard sucking the saliva between their teeth, evidently semi-consciously dislodging food particles. With each act of deglutition, too, the floor of the mouth is brought upwards and the tongue pressed forcibly on the teeth and palate, while part of the saliva from the sublingual and submaxillary glands is forced out between the teeth. Then again the tongue performs certain movements which tend to dislodge food particles. It may be pushed out over the molar teeth, the point bent upwards or downwards between the cheek and the gum, and then carried forward, or it may otherwise be thrust between the teeth and the cheek or lips and made to dislodge particles of food.

There are certain conditions which influence this self-cleansing process, for example, the arrangement of the teeth. I have shown elsewhere (Essay on the Irregularities of the Teeth) that the arrangement of the teeth is chiefly influenced by dietetic considerations, but what I would here refer to is that the natural movements of the jaws during mastication are frequently prevented by the malocclusion of the teeth. It often happens that the occlusion is of such a nature that the lateral or grinding movements

are prevented. Now this grinding movement is of importance especially for the cleansing of the molar teeth, for the greater the lateral movement the more is the saliva pressed and sucked to and fro between their approximal surfaces. I shall have occasion to refer again to their arrangement in elucidating susceptibility and immunity of the different teeth.

Another condition of some little importance in the self-cleansing process is the mucous coating over the teeth. In every mouth there are parts of the teeth which are not naturally subjected to much mechanical cleansing, and these parts are consequently liable to harbor food particles. They are more or less protected by a thin slippery film which adheres to the teeth so firmly that if the tongue is swept over it it is not removed. Now if the particles of food lodge on the surface of this film the self-cleansing motions of the lips, cheeks and tongue tend to dislodge them. Similarly the removal of particles of food by the tongue from the mucous membrane of other parts of the buccal cavity is no doubt facilitated by the slippery nature of the membrane. It is thus somewhat important to stimulate the mucous secretions of the mouth by the consumption of a fairly coarse and fibrous diet, and as we shall see presently, the stimulation of the mucous membrane to epithelial proliferation helps to prevent acid formation.

Then, again, the relative amount of carbohydrate in the food is of importance. If it is concentrated and soft it is much more liable to cause caries than when it is small in amount compared with the quantity of fibrous matter which demands considerable mastication and insalivation. The presence of much sugar in the food is of special importance, because the action of the saliva is hampered by the presence of sugar. It may perhaps be imagined that children always consumed nearly as much sugar as they do now, but note this fact: "In 1883 the import of sugar for home consumption per head of the population was 9.91 lbs. of refined sugar; in 1900 it was 52.23 lbs." This does not represent the total increased consumption of sugar, for there has been an astonishing increase also of tinned fruits, which are generally preserved in syrup. I need hardly mention that some people consume more sugar than others, and here again we have a potent cause of variation in susceptibility and immunity.

The nature of the saliva varies under different circumstances. In

a state of health it is alkaline, abundant and active, and when the subject suffers from dyspepsia it may be acid and more or less inactive. In cases of hyperchlorhydria, however, it is said that the saliva is markedly alkaline, a condition which shows certain important relations of the gastric and buccal secretions. In fact, I believe that the secretions of the mouth are almost as frequently vitiated by the consumption of unsuitable food as are the secretions of the stomach and intestines, and one of the commonest forms of indigestion is what we may call oral indigestion. This closely resembles indigestion in the stomach, and is associated with insufficient movement, vitiation of the secretion, tardy chemical digestions, prolonged lodgment of the food, fermentation, and frequently acute pain. The conditions above referred to are directly and indirectly almost entirely the result of improper food, and consequently the susceptibility and immunity brought about by oral indigestion are almost solely of dietetic origin.

In conjunction with the variable nature of the salivary secretion, due to the difference in chemical and physical properties of the food, we should note the difference in quantity of the mucus secretion. If the food is of a bland, soft nature it is not stimulated much, but if it is coarse and fibrous the secretion is considerably augmented. The nature of the mucus should be considered. It clings tenaciously to the surfaces with which it comes in contact, and thus, besides facilitating deglutition, it coats the teeth where they are not subjected to friction, and being of an albuminous nature it does not induce the acid-forming bacteria to proliferate, while if the food is acid it becomes insoluble and forms a more or less impassable barrier for the acid. After the meal, however, the alkaline saliva—in which it is soluble—tends to clear it away, together with adherent food particles. Akin, no doubt, to this mucus coating are the gelatinous plaques under which caries starts, and I am inclined to believe that decay occurs not on account of the plaques, but in spite of them.

We may now consider the nature of the microorganisms of the mouth. Some are acid-producers, some are liquefiers, and some produce acid or liquefy according to the medium in which they exist. It is obvious that those bacteria which liquefy gelatin and other albuminoid substances must be of great importance in rendering shreds of foodstuffs soluble and so helping to clean the buccal

cavity, and within limits the acid-producers may have a similar function. In fact, it would seem impossible to do without the mouth bacteria, as there is no ferment in the mouth capable of digesting the albuminous shreds and particles which otherwise would be bound to accumulate between and about the teeth. (Compare the septic tank system for the purification of sewage.) It may be said that at least it would be well to do without a considerable proportion of the acid-producing bacteria, for without acid it is impossible to have dental caries. No doubt this is so, but this result is best obtained by efficient mastication, for food which requires considerable mastication calls forth a corresponding flow of saliva which gets thoroughly incorporated with the food. The ptyalin converts the starch into a soluble form, while the mastication expresses it from the rest of the bolus. Therefore the starchy matter is more or less thoroughly swallowed while the remaining part is being more completely masticated. By this means the smallest possible residue tends to lodge about the teeth, and what little does remain, being almost devoid of starch, allows the bacteria which liquefy to predominate, while preventing the multiplication of the acid-producing bacteria. If, however, food—especially of a starchy nature—is taken in a soft form the flow of saliva is, relatively to the amount of starch, but inefficiently stimulated. The starch is not fully converted and swallowed, but remains plastered, as it were, into all the crevices about the teeth. Furthermore, the chronic lack of efficient stimulation of the salivary glands engendered by relatively soft foods no doubt leads to a corresponding lack of development and output of ptyalin. Now if there is a relatively large amount of starch left about the teeth, can we wonder that the acid-producing bacteria largely preponderate and play havoc with them?

There are some clinical observations which tend to further corroborate these observations—for example, the fact that millers who are constantly breathing flour dust are particularly susceptible to caries, while those who suffer from chronic gingivitis due to tartar show signs of immunity to the disease. In the first case we have a constant supply of carbohydrates without the physiological processes which clear them from the mouth, and a consequent increase in the number and intensity of the acid-producing bacteria, while on the other hand the chronic inflammation of the gums at

the necks of the teeth gives rise to an undue proliferation of the albuminous epithelial and other cells and a consequent increase in number of the liquefying bacteria. Presumably also the inflammation produces an increased flow of the *alkaline* secretion which is normally produced at the necks of the teeth. This at least may be assumed to take place in the early stages of the disease before there has been much destruction of the structures around the necks of the teeth.

Another observation which leads me to similar conclusions is the fact that the excavation of carious cavities is more or less painless when the decay is slow, while it is as a rule rather painful when the caries is rapid. When the decay is slow, carbohydrates being limited in amount, the proliferation of the liquefying bacteria is as a rule predominant, and consequently the dentinal fibrils are disintegrated in advance of the decalcification, while when the caries is rapid the acid-producing bacteria are particularly predominant, and therefore the dentin is decalcified in advance of the living and sensitive dental fibrils. So, too, if a very sensitive cavity is but partly cleaned and covered over with cement so as to exclude carbohydrates more or less completely, it will gradually become less sensitive as presumably the liquefying bacteria destroy the albuminous fibers.

"The question of the varying susceptibilities of different teeth to caries still remains an unsolved problem" (Miller). Therefore if we can show that the known susceptibilities of the various teeth conform to the principles and are the result of the conditions which we have explained with relation to susceptibility to caries in general, then not only will the solution of an unsolved problem be an interesting addition to our knowledge, but it will be an argument of considerable importance in establishing the truth of the general contention which we have already advanced. We now enter upon a problem which obviously does not necessitate our making further reference to the nature of the food, as we have to deal solely with the conditions which permit of the lodgment of fermentable food where susceptibility is known to exist, while we have to demonstrate that these teeth or parts of teeth which show immunity are subject to those self-cleansing processes already described.

We should remember the direct effect of mastication; the indi-

rect effects of mastication, i. e., the muscular contractions of the tongue, cheeks and lips, and the influence of these on the fluids of the mouth; and the effect of ptyalin in dissolving the carbohydrates and thus facilitating the removal by swallowing of the converted starch.

Let us first direct our attention to the lower incisors and cuspids, as these teeth are peculiarly immune to caries. Their shape is such as to render the lodging of food practically impossible except on their approximal surfaces, for not only are there no crevices in which food might lodge, but the motions of the lower lip and tongue are greater over their labial and lingual surfaces than over any other teeth. Leaving other things out of account for the present, the fact that the mandible and the tongue are relatively fixed posteriorly shows that the greater susceptibility for food to lodge must be toward the back of the mouth. So, too, the saliva is for similar reasons caused to pass between these teeth more freely than it does at the back of the mouth.

Again, when a piece of food is cut by the incisors the lingual surface of the superior incisors acts as a buttress upon which it is held while the lower teeth cut through it. While the lower incisors are passing through the food it is gliding down over their labial and lingual surfaces, thus keeping them clean, so that even though the lower incisors are irregular through crowding, the rubbing past of the food while it is being incised greatly prevents as a rule the tendency for food to lodge and undergo fermentation. In this we see a remarkable difference from the upper incisors, for as their lingual surfaces act as a buttress to the food a certain amount is squeezed between them, and therefore their approximal surfaces are liable to hold food, which may undergo acid fermentation. The incisors are unlike other teeth in that when slightly spaced they are not so susceptible to caries as molars and bicuspids. This follows as a natural sequence from the fact that they do not bite the food down to the gum and leave it to lodge there. Each act of mastication tends to force it out from between the upper incisors, while the motions of the lips and tongue render it well-nigh impossible for food to lodge between the lower incisors when they are spaced.

When there is crowding of the upper incisors the liability of food to be wedged between them is great, and consequently the

tendency to caries is very considerably increased. There are frequently pits and crevices on the lingual surfaces of the upper incisors, and these, of course, are apt to have food jammed into them and consequently to become carious.

The cuspids are particularly insusceptible to caries, and if their shape is considered it can hardly be wondered at. We may here illustrate an interesting fact. Though the shape of the tooth may in itself be of such a nature that food does not tend to lodge about it, yet the approximal teeth may have considerable effect in modifying this. Now it frequently happens that the first upper bicuspid decays on its mesial surface from the lodging of food, but of course this same food lodges against the distal side of the cuspid. We consequently expect and almost invariably find that there is approximal decay on both teeth. However, it should be noted that the tooth presenting the broadest and flattest approximal surface (the bicuspid) is liable to be most affected, and, moreover, that the decay is most diffused. This naturally follows, as the fluids passing between the teeth are, as it were, focussed in passing over the more rounded tooth and exert their beneficent influence, while the food tends to lie on the flattened part of the bicuspids. The usual channel for the saliva is therefore closest to the most rounded tooth, and thus it may escape the destructive action of the acid fermentation altogether.

Passing now to the bicuspids, it need be remarked only that they are intermediate in size, shape, and position to the rest of the teeth, and are therefore intermediate in their susceptibility. Interstitial caries is fairly common, and the crevices between the cusps give rise to a susceptibility such as would be expected from the principles already brought forward.

The first molar is particularly susceptible to caries for the first few years after it appears, and its liability to be attacked rapidly declines after about the eleventh year. In fact, if it has not been attacked before the child enters its teens, this tooth shows but little special susceptibility to caries. This may seem a curious and almost inexplicable problem, but I think it explains itself very easily. First, it should be remembered that the natural crevices are well marked, and the breadth of the tooth keeps the tongue and cheeks well away from the crevices and approximal parts midway between the lingual and buccal surfaces. This of course does not help

much to explain the special susceptibility of the tooth to decay in the early years of its existence, but it allows of a mal-environment being easily produced. Second, it should be noted that during the first six years it is the most posterior tooth in the mouth, and the motions of the cheeks and tongue are relatively not very pronounced in its neighborhood. Third, in the earliest years of its existence the habit of mastication upon it has not been acquired, nor is there any special demand for more masticating surface than the temporary molars afford. At least there is no special demand for it if relatively soft food is consumed. Fourth, the circumstance which hinders the child acquiring the habit of masticating efficiently, and consequently of acquiring the beneficial results of efficient mastication, is the fact that the temporary teeth begin to be shed just after the eruption of the first molar, and their looseness or tenderness tends to prevent the child masticating as efficiently as it otherwise would. Fifth, the fact that by this time the temporary teeth are frequently carious and tender often leads the child into habits which only remotely resemble efficient mastication. Lastly, during this age sweets are frequently consumed much too freely.

I need not now go into much detail with regard to the second and third molars; the only special fact to which we need refer is the rapid and frequent destruction of the latter. Here we need only remember the circumstances already referred to, namely, the position towards the back of the mouth and the very lengthy period which usually elapses between the cutting of the cusps of the tooth and its rising to its position of full functional activity. When teeth in front of it have not been lost the third molar may generally be regarded as more or less impacted, and not only is it uncommonly slow in erupting, but it has an unfortunate method of cutting the gum. When a molar cuts the gum as it should the cusps cut it first, and the tooth rises a considerable distance before the gum which stretches over the crevices disappears, so that these crevices are specially protected during that dangerous period when the tooth cannot be used for efficient mastication, but in the eruption of a lower third molar the two anterior cusps cut the gum which overhangs behind, and tend to lodge food during the whole time of eruption of the tooth.

How little the nature of the tooth itself has to do with the ques-

tion of susceptibility may be gathered from the fact that if the teeth in front of it have been removed, so that it erupts normally and easily, the third molar seems even in "susceptible" mouths to be fairly "immune," provided it occludes properly with its fellow above or below. (I have used the words "susceptibility" and "immunity" in this essay, though I do not believe that the use of these words in relation to dental caries is strictly accurate. There is little or nothing corresponding or analogous to the conditions which produce susceptibility and immunity to specific diseases.)

I have not gone into the subject so fully as its importance demands, but my object has been merely to supplement and further corroborate the contentions originally brought forward in my book on "The Cause and Prevention of Decay in Teeth." Moreover, the problem is so very simple, provided we realize the real nature of the process of mastication, the function of the saliva and ptyalin, and the nature of the food. In conclusion I would urge upon the reader the following generalization: The cause of the present-day susceptibility to dental caries is that the natural foodstuffs are to a large extent deprived of their accompanying fibrous parts, and prepared and consumed in a manner which renders them—especially the carbohydrates—liable to lodge and undergo acid fermentation in the mouth, while from the same cause and the induced conditions the acid-producing microorganisms of the mouth lodge and multiply and augment the rapidity and intensity of the acid fermentation.

REMEDIES FOR PREVAILING MISTAKES IN DENTAL PORCELAIN ART.

BY FRANK E. CHEESEMAN, D.D.S., CHICAGO. READ BEFORE THE MISSOURI STATE DENTAL ASSOCIATION, AT ST. LOUIS, MAY, 1905.

It seems safe to assert that porcelain art in all its branches is at the present time the subject of greatest interest to the majority of the practitioners of dentistry. The reason for this is that all the others, consisting of gold and plastic filling, gold crown and bridgework, artificial dentures and the treatment for the different pathological conditions of the teeth and surrounding tissues, have been the subjects of papers and discussions for many years and have been reduced to almost an exact science.

But we are still at sea as regards the working of porcelain, with the result that many sad and humiliating failures have ensued, and yet such a large percentage of successes has resulted that it seems reasonable to assume the failures have been due to a lack of skill or of judgment rather than an inherent defect in the material, if properly used in the right place and under favorable conditions.

The manipulation of porcelain is most fascinating to the majority of us who adopt it, because of the esthetic results obtained, and it is often difficult to differentiate between enthusiasm and conservatism in its use. It is an example of the trite saying that "A little knowledge is a dangerous thing." Many of us have employed it for bridge and inlay operations without a proper knowledge of its manipulation, and where the conditions were such that failure was certain to result. The consequence has been that our patients have often become prejudiced against this class of work, and it has also resulted in somewhat of a reflection upon the ability of those employing it. As a further result we have been liable to condemn its use for all classes of cases, thereby abandoning a valuable adjunct to our practice and one that renders the greatest esthetic satisfaction to our patients, providing always that the conditions are favorable for its use and the technique is successfully accomplished.

It is my desire, as one who has had considerable experience and many failures in this branch of practice, to make to those of you who are contemplating its use a few suggestions which I trust may spare you the mortifying and trying experiences of your predecessors. The most skillful men in porcelain work have had many failures charged up to their account, and it should be the constant aim of those of experience to caution the beginner against the same kind of mistakes.

The first subject to consider will be "fixed" porcelain bridgework. The conditions necessary for the completion of a successful operation are as follows: 1. As a general and I will say invariable rule (unless conditions present which will be spoken of later), never attempt to supply more than two missing teeth for posterior, and as an extreme limit, the span from cuspid to cuspid for anterior bridges. The exception to this rule might be great length of bite, insuring large bulk of porcelain, or entire occlusion

with an artificial denture, which would greatly relieve the stress. As an evidence of the importance of this, it is only necessary to call attention to Dr. G. V. Black's article entitled, "The Force Exerted in the Closing of the Jaws," published in the *Cosmos*, 1905, page 469, in which his tests showed that the average stress on molars is about 175 pounds; full upper and lower dentures, 20 to 30 pounds; full upper denture and natural teeth below, 30 to 40 pounds. Bridges not mentioned in above article; the probable range is from 50 to 125 pounds, depending upon conditions, the stress being divided between the abutments. There are individual cases, however, where the stress on molars goes to 350 pounds. These gnathodynamometer tests prove that this consideration should invariably be a factor in the selection of cases. 2. Sufficient length of bite to insure bulk of porcelain to withstand stress of mastication. If these two fundamental conditions are not present it will be simply courting failure to employ this type of bridgework.

Assuming that the conditions are thus satisfactory, the following rules must be observed during construction: 1. Allow for equal distribution of stress between the abutments, the platinum framework and the porcelain. 2. Cut teeth to be used as abutments below the free margin of the gums, buccally or labially and lingually, removing all enamel with chisels and cleavers, paralleling and smoothing sides so that bands will conform closely to periphery of the roots.

3. Use 28-gauge platinum for bands, which should be very narrow and extend but slightly within the free margin of the gums. This for two reasons—first, that no subsequent irritation will result from impingement upon the peridental membrane; and second, that all the possible bulk of porcelain may be obtained. The platinum framework should be in absolute apposition and secured with 25 per cent platinum solder. Floor of caps should be made of iridio-platinum plate, and connecting bars between abutments should be of 14-gauge round iridio-platinum wire. To have as small bulk as is consistent with the greatest strength, these connecting braces or bars should conform closely to saddle and teeth, in order to obviate as far as is possible any division of porcelain. The lingual surfaces of crowns and supplied teeth should be extended with iridio-platinum plate, to act as box for porcelain and to withstand lateral stress.

4. If platinum saddle is used (and in my opinion same should be employed only for upper bridges) care must be exercised that an accurate adaptation is made to the gum tissue, burnishing thoroughly in the mouth until the tissue shows white, after soldering to abutments, but before bars and teeth are attached. Saddle should be only wide enough to extend slightly over the ridge on either side, as the least unnecessary impingement on the soft parts is almost sure to cause irritation and subsequent absorption of the tissue. For lower bridges a round 14-gauge iridio-platinum bar should be bent to conform closely to the ridge, extending a second bar straight across from abutment to abutment, reinforcing with a small brace between, building porcelain around this so that it will cover the bar and rest snugly upon the gum. This will result in a more hygienic bridge and one that will not irritate in the least, the tissues taking much more kindly to porcelain than to platinum.

5. Exact condensation and fusing of porcelain. This item is of the utmost importance and upon it depends the successful completion of the operation. If these precautions have been taken and good judgment used in the selection of cases, fixed porcelain bridgework will form a satisfactory and lucrative feature of our practice.

The next subject to be considered is that of baked porcelain crowns. While it is true that ready-made crowns, such as the Logan, Davis, Brewster, Justi, etc., in the hands of the skillful and conscientious operator answer a very good purpose, my preference has always been for the crown that is specially made for the case in hand, and it seems reasonable to assert that more exact results, both mechanically and artistically, will follow its use, and it is this form of crown that we will now consider.

It is here that we should exercise much more latitude in the selection of cases on account of the esthetic feature, and I am free to confess that I have not for several years considered any other form of crown anterior to the second molar, if exposed to view, no matter what the conditions might be as to occlusion or stress. If the bite is short the lingual surface of the crown should be reinforced with iridio-platinum plate, which should preferably reach almost to the occlusal surface. To my mind the use of the unesthetic and unsightly gold crown for teeth that are exposed to view is entirely unnecessary and should be considered bad practice.

For incisor, cuspid and bicuspid crowns facings should be used, as it is necessary to cover the band with porcelain which will be securely retained, and which can be done only by grinding facing to entirely cover the band—this to prevent a blue line or shadow caused by the platinum showing through at the gingival margin, even though the band, unless so hidden, be entirely covered by the gum.

For molars, however, more artistic and better results may be obtained by building the whole crown without the use of facings. To insure attachment of porcelain to platinum cap, allow dowel to extend crownwise through cap and half way to occlusion, and then spur the cap with a pointed bur. This, with the metal lingual back, will be found ample to retain porcelain.

The use of oil colors will aid in reproducing defects or peculiarities of the adjacent teeth, and in my practice they have been invaluable in touching up facings to overcome the artificial effect of those we purchase from the dental depots. Porcelain bridges and crowns should be fastened to natural roots with gutta-percha alone or with gutta-percha and a very slight veneer of cement. If from any cause it is deemed necessary to remove them they are then easily loosened by heating thoroughly with a polishing buff revolving rapidly in engine, after having had patient hold water in the mouth as hot as is bearable.

Porcelain Inlays.—The first requisite for porcelain inlays is selection of the proper place in which to use them; second, mechanical cavity preparation; third, absolutely accurate fitting of matrix; fourth, proper selection of colors to match as nearly as possible those of the natural tooth; fifth, accurate fusing of the porcelain so that the colors will not be dissipated and that the maximum strength of the material may be secured; sixth, setting of the inlay with cement.

I have reluctantly arrived at the conclusion that it is not advisable to use porcelain inlays for that class of cases where the margins of cavity and inlay are to be subjected to stress, unless the finished gold filling or inlay would be unsightly—as, for example, a large cavity in the mesial surface of an upper first bicuspid, in which case margins of cavity should be extended to descending slope of the cusps; or, better still, if the tooth be pulpless, to resort to extensive preparation by removing cusps, cutting occlusally and

distally below the contact point of the second bicuspid. By such procedure margins may be removed from all danger of occlusal stress, with sufficient bulk to obviate danger of subsequent fracture of porcelain. I would therefore limit their use to such cavities as those in which the margins will be in no danger from occlusal stress, with the exception of incisal restorations, where of course they are clearly indicated on account of the esthetic requirements.

Preparation of Cavities.—Cavities should be prepared for the reception of porcelain inlays much as they should for gold fillings, with the exception that there must be no undercutting or interlocking. The margins must be prepared with beveling, as for gold fillings, but with a semi-acute rather than a right angle, as is advocated by some writers. The special advantage of this lies in the fact that by this method we secure greater bulk of porcelain at these points, and that is certainly where it is most needed. It also lessens the danger of future chipping by giving a closer joint between porcelain and enamel, besides giving additional support by the cement to the enamel walls. Walls of cavity should be nearly perpendicular, with a slight divergence outward to allow of removal of the matrix without distortion; cavity to have broad, flat seat, with step formations when conditions permit, and, generally speaking, as much mechanical (or, if you prefer the term, frictional or surface) retention as it is possible to obtain. The detail of cavity preparation is fully given in the article by Dr. C. N. Thompson, published in the April, 1904, DENTAL DIGEST; also the article in the *Summary* of January, 1903, valuable aids to this work which I recommend for your perusal and study.

The fitting of matrices, the selection of color, and all the subsequent details have so often been fully described that it is unnecessary for me to enter into them at this time. The vital points necessary to the making of successful inlays—and by that I mean those which will stay in place and preserve the teeth—are the selection of the places where they shall be used and the preparation of cavities for their reception. The other features of this work are the results of skill in selecting shades, dexterity in manipulating the matrix and porcelain materials, and are a matter of personal equation.

The artistic achievements in this class of work are very fascinating and very important, but above everything else we should aim

to make the work permanent and serviceable. A beautiful inlay which deceives the eye in its natural appearance, but which in a short time is sailing tranquilly down the alimentary canal, does not come under the head of success, so far as your essayist's judgment goes.

MOVEMENT OF THE JAWS IN THE MASTICATION OF FOOD.

BY A. O. HUNT, D.D.S., OMAHA, NEB. READ BEFORE THE NEBRASKA STATE DENTAL SOCIETY, AT LINCOLN, MAY 16-18, 1905.

With the improvements made in the methods of preparing all kinds of food in the kitchen, there would seem to be no great necessity for mastication or digestion. The chemistry of cooking is now so well understood and generally used that the process of digestion is largely accomplished by the skillful manipulation of food by the cook; furthermore, the "hanging" or "ripening" of the tougher-fibered meats assists the process of digestion and mastication materially. There does not seem to be the need at the present time for extraordinary attention to be paid to the act of masticating or comminuting food that there was when this chemical knowledge of the preparation of food was not so universal. The result of this condition is a considerable indifference on the part of individuals in the use of the teeth for masticating purposes.

The leading works on anatomy describe accurately all the muscles and tissues that are in any way connected with the act of mastication, so also the standard books on physiology give carefully each function performed by the several parts involved, except the teeth themselves. It is not necessary for me to go into the details of descriptions found in such works, as you are all familiar with them. Were we, however, compelled to limit our knowledge of the anatomy and physiology of the dental organs to what is contained in these works, we would be at a decided disadvantage in our everyday work as dentists. The comparative anatomists and odontographers give us very careful details of the teeth of all animals, man included.

With all these valuable instructions at hand and easy of access, there is still a field of investigation for the dentist on all these subjects, to collect, if possible, all the facts to be found to exist in

regard to any function where the dental organs are concerned. This will not be done by anyone else so well as it should and has been done by the investigating and scientific dentist.

I am well aware that this sort of effort is not generally given the encouragement, nor does it call forth the interest it deserves when brought to the attention of the profession at large. Even in the societies of our calling such subjects are only slightly discussed at the meetings when presented. There are so many that say they want "something practical." *All facts are very practical and science is the finding and presentation of facts.* It is very difficult to give recognition to the position of those different readers and thinkers who would hold dentistry within the boundaries of art alone, or who believe that all there is in dentistry is the making of some artificial substitute for the lost teeth or parts of them. It would be impossible for dentistry to occupy the position it does to-day had not the patient investigator and reader presented to us the great array of facts that were dental in their character, and are in themselves most decidedly practical, and are used daily by those who speak of these things lightly.

It is perhaps not out of place to mention some of the results referred to. The histology of the teeth has been developed entirely by the investigations of dentists, and the treatment of the teeth was not so thoroughly accomplished before this information was presented as since. So, also, as regards the investigations of the dentist into the anatomy and physiology and pathology of the prophylaxis and the better saving of teeth. The patient work of the dentist in metallurgy has given us practical results in better filling materials and their use.

The investigations of the oral surgeon have made all operations in the oral cavity simpler and prevented the disfigurement of the patient. In this same field the dentist and his investigations make it possible to treat fractures and the maxillæ in a most practical way and always secure a good bony union of the parts. Still further, the investigations of the dentist have made it very practical to now perform operations for cleft palate with a success in the restoration of speech not before attainable. Instances could be multiplied indefinitely until there would not be any part of our daily practice that was not deeply indebted to this class of investigation. Subjects called scientific or theoretical by those who are

always wanting nothing but "practical" things are thus the most practical.

The thought I wish to present is, if true, eminently practical and will be of daily use. Everything connected with it did not originate entirely with me, although a portion has been a part of my teaching for some years in dealing more particularly with the art feature of dental prosthesis. Mr. Robert Brewster some two or three years ago called my attention to a fact and suggested a radical change in the making of the occlusal or masticating surfaces of artificial teeth, which I am inclined to believe from my own investigations will at some time be adopted, as it will very greatly increase the comminuting power of artificial teeth, which has been shown by many tests not to be as great as that of the natural teeth. I therefore present Mr. Brewster's idea as embodied in a paper which was to have been read at the Fourth International Congress, but which for some reason was not placed. "The generally accepted understanding of the process of mastication in the human subject is that food is incised, crushed and ground between the superior and inferior teeth, and during these processes is freely mixed with saliva to aid its reduction and preparation for deglutition."

My observations have led me to the conviction that the foregoing is not in all respects correct, and that a close adherence to the accepted view has led to error in the construction of artificial teeth used as substitutes for the natural organs. My view is that no grinding motion—due to a lateral movement of the lower jaw—is present in mastication, the act of chewing being a direct upward movement of the lower jaw.

Under the stimulus of food the muscles act without a conscious effort. This automatic action is sometimes brought forcibly home to us when a piece of bone—which has escaped the vigilance of the tongue or mucous surface—is bitten upon with force. The primary action of the temporal and masseter muscles, assisted by the internal pterygoids, is to raise the lower jaw vertically, and it is very doubtful whether during mastication this *direct motion* is ever modified without a conscious effort.

When the full force of these muscles has been exerted upon food opposing the closure of the jaws, they give place to the pterygoids, whose function is to laterally displace the lower jaw,

carrying with it the food from under the upper teeth that it may be manipulated by the tongue, bathed in saliva, and brought again to its position from the crowns of the lower teeth from the direct closure of the jaws.

The cusp formation of the posterior teeth, presenting as they do a series of modified inclined planes—especially adapted for the separation of fibrous or other hard material—strongly supports the view that, although by a conscious effort during mastication the lower jaw may be moved laterally, such a movement is made at the expense of the pressure, the efficient work of comminuting food, whether of a fibrous or granular character, being accomplished only by a direct upward movement of the lower jaw.

Granting the correctness of this view, the more pronounced the cusps—given a perfect articulation—the better the masticatory apparatus. While this is true as regards natural teeth, it is not so with artificial substitutes. Pronounced cusps on artificial teeth have not proved successful in consequence of the liability to displacement of the denture; in fact, the general tendency in the profession is towards more even surfaces, based not only upon experience as to that one form of displacement mentioned (due to food wedging between opposing prominent cusps), but possibly also upon the erroneous view that the food is subjected to a grinding action resulting from a lateral movement of the lower jaw.

The imperative necessity of providing in artificial teeth an efficient surface for the comminuting of food appears to require special cusp formation for molars and bicuspids, so that the food may be perfectly disintegrated without any liability to tilt or disturb the denture. The cusp formation now presented for the first time, I believe, will amply meet these requirements, for while presenting a much larger area of incising surface than is found even in nature (in the average mouth met with), there are no prominent cusps to catch hard portions of food between them.

The efficiency or actual working capacity in the mouth of a full set of artificial teeth is governed not only by its adaptation and its correct occlusion, but also depends largely upon the condition of the mucous membrane underlying it. It is therefore of the utmost importance that during a temporary systemic disturbance or other cause giving rise to a tenderness of the mucous membrane, the denture should retain a large measure of efficiency.

This desirable condition is possible with teeth of the form before you. Tests made upon different materials have shown that a pressure of 50 pounds with these teeth is equal in result to that of 150 pounds in a human mouth upon the same materials. (This above is from the paper of Mr. Brewster.)

Now we know that the food when in the mouth is moved about and also kept in place by the action of the tongue and cheeks and allied tissues. It is kept in the space so formed between them, and masticated or comminuted by the action of the occlusal surfaces of both superior and inferior teeth upon the mass or bolus. There has been a well-settled idea that by a lateral or buccal motion of the teeth from side to side in performing this act the result was obtained. While this may not be entirely wrong, in the main it is not correct. I have here some models of natural teeth mounted upon anatomical articulators, and upon investigation you will see that a very extensive lateral motion is not possible when the surfaces of the teeth are in sufficient contact to exert any force in comminuting the food between them. A different motion of the jaws is necessary whenever there is anything of a hard or fibrous nature to be masticated. The lateral motion of the jaws is very slight; in fact, I am surprised to find that it is so much less than I have always believed existed. This movement is much less than the linguo-buccal surface of a molar tooth—in fact, not more than one-half of this distance.

The movements of the jaws are necessarily in an antero-posterior direction when the greatest force is exerted. The articulating surfaces of the teeth with each other are of such a character, the lingual cusps of the superior fitting into the sulci of the inferior teeth, and the buccal cusps of the inferior fitting as closely into the sulci of the superior, combined with the overbiting of the superior anterior over the inferior anterior teeth—all these circumstances prevent the lateral movement in the act of vigorous mastication.

The antero-posterior movement is possible, and the facets worn upon the surfaces of the teeth, as shown by the models presented, indicate that this is the movement in common and at the time the greatest force is active, the facets extending as they do from the occlusal margins of the incisors to the sulci and cusps of the bicuspids and molars that are in apposition. A more practical

investigation of this movement may be made by observing these facets as shown in the mouths of patients you see daily. A still more practical one is to observe in yourselves the motion of the jaws while endeavoring to comminute a tough fibrous piece of poorly-cooked meat or other food.

DENTITION.—Thirst, nausea and vomiting, indicating irritable stomach, are relieved by bismuth subnitrate a few grains (says the *Alkaloidal Clinic*). Often the thirst and nausea indicate the need of a gastric tonic like quassin or calumbin. Children who have taken plenty of soluble lime salts during teething have good teeth in after life.

NEWSPAPER COMMENT AS A PROFESSIONAL STIMULUS.—We read (*N. Y. Med. Jour.*) that in a certain town in Illinois a discussion has arisen regarding the mention in newspaper reports of the name of the attending physician in an accident case. One physician is quoted as saying that the statement in a newspaper of the name of the surgeon involved "would spur him on to greater efforts to secure the complete recovery of his patient." We always hesitate to comment on newspaper quotations of the alleged statements of physicians; but if any member of our profession made the foregoing remark he should instantly matriculate into some profession or business where the lack of journalistic comment, which is so stimulating to him, would not necessarily imperil the lives of others. The remarks exhibit a mental attitude that we cannot harmonize with our concept of any physician, however unfit.

HEMOPHILIA.—Dr. Lossar (*Internat. Jour. of Surg.*) has made an interesting report on a family of bleeders in which this condition could be traced through four generations. Among 207 members of this family there were 37 hemophilics, all of the male sex, that is, one-third of the male members were bleeders. The most common signs of this condition were hemorrhages under the skin due to blows, falls, or overexertion, as well as epitaxis, hemoptysis, and hematuria. Almost half of these hemophilics died, usually during infancy, while the tendency to hemorrhages diminished as they grew older. The fact that there were no bleeders among the female members conforms with the law that the disease is transmitted through the women, who themselves, however, escape. In the case of hemophilic males who marry women of healthy family the disease is not transmitted to the offspring. In regard to the causes of hemophilia our knowledge is not yet complete. The view that the blood is poor in fibrin is erroneous, for it behaves towards styptics just as does the blood of healthy people. The application of iron perchlorid, and especially of the cautery at red heat, will arrest the bleeding, but the slightest touch removes the clot. In those frequent cases of wounds of the lips, tongue, and gums, the crusts are usually easily removed by sucking and licking, with recurrence of the hemorrhage, and subsequent death through anemia. If possible after the application of the cautery a firm dressing of dry aseptic gauze should be applied.

Digests.

PREVENTIVE TREATMENT OF THE TEETH, WITH SPECIAL REFERENCE TO SILVER NITRATE. By W. D. Miller, M. D., D. D. S., Ph.D., Sc.D., Berlin. Ger. Read before the British Dental Association, May 20, 1905. It is a fact which is naturally familiar to all practitioners of dentistry that operations on the teeth require much time, are difficult to perform, and are often exceeding disagreeable if not actually painful for the patient. The insertion of a filling of gold or even of amalgam on the approximal surface of any tooth, including of course the preparation of the cavity and the polishing, requires more time than the amputation of a leg, and often more than a laparotomy, and when it comes to treating the root-canals of molars the time employed may be many times that required for the most vital surgical operation upon which depends the life of the patient. As a result of this condition of affairs the treatment of diseased molars is a luxury attainable only for a very small proportion of the human race—taking it the world over, possibly one in a thousand—and it seems to me that it should be one of the highest aims of the dental profession to make its services accessible to the millions of tooth-suffering humanity who at present are absolutely uncared for.

We must therefore look upon same as just and commendable, when efforts are made to discover and introduce procedures which will diminish the tendency of the teeth to decay, as well as simplify the treatment when once decay has set in. Naturally our efforts as dental physicians should be directed, through the various hygienic measures at our command, to bringing about as perfect development of the teeth as possible, since we must still cling to the idea that well-developed, perfectly-calcified teeth are less susceptible to decay than those of the opposite character. Furthermore, by the giving of proper attention to the physical and chemical properties of the food and to the daily care of the teeth on the part of the patient himself, we are able to do much to diminish the ravages of caries.

The introduction of plastic fillings was a very important step toward popularizing dentistry, and has been an incalculable boon to humanity. The attempt to find means and ways of so im-

pregnating the necrotic dental pulp as to render it permanently aseptic and innocuous, thereby doing away with the necessity of removing the last traces of it from tortuous canals, has not as yet met with as high a degree of success as was hoped for. It is very desirable that investigations on this line be continued, since there can be no doubt that if successful a great victory would thereby be gained over disease, and countless millions of teeth saved that are otherwise extracted or simply allowed to rot away, spreading pain and disease all about them.

I shall, not, however, discuss these factors here, but wish to refer to efforts of a more special nature which have been made to prevent the occurrence of dental caries or to check its progress. I only call your attention to the operation formerly extensively practiced, of making wide separations between the teeth by means of a separating file, and to more systematic V-shaped separations recommended by Arthur. These have now scarcely more than historical interest.

In recent years two different methods have been followed out in so-called preventive dentistry, the one employing mechanical, the other chemical, agencies to accomplish its purpose—the chief advocates of the former being Drs. Wright of Cincinnati and Smith of Philadelphia; of the latter, at present, Dr. Bryan of Basle. The first-named gentlemen recommend and practice what we may call extreme cleansing and massage of the teeth. Their patients are required to present themselves once a fortnight, or at least once a month, when every tooth is subjected to a rigorous cleansing and polishing on every surface, wood-points with pumice being used for the purpose. There can be no doubt that so thorough a cleansing of the teeth repeated at regular short intervals will do much to keep them and the gums in a healthy condition. Dr. Bethel reports, after examining a number of Dr. Smith's patients, that all "had beautiful clean teeth and gums, wholesome, clean mouths, and there was an entire absence of that disagreeable odor noticeable from unkempt mouths." It must not be overlooked, however, that any person who is willing to visit the dentist and spend several hours in his chair once a fortnight or once a month must naturally also spend much time over his teeth at home, and to this fact the condition of the teeth examined is no doubt in good part to be attributed. We have no reason to

question the accuracy of Dr. Bethel's report, and we are agreed that much credit is due to the dentist who can inspire his patients with so much zeal in the care of their teeth. There is no doubt that much good would result if we should all, much more than has heretofore been the case, educate our patients as to the importance of constant care of the teeth and the manner in which the daily cleansing is to be performed.

The idea of Smith, that by rubbing a tooth with a wooden stick once a month, or even once a fortnight, one can bring about a reaction on the part of the pulp and a solidification of dentin, cement, and enamel is, however, open to criticism. It is very doubtful whether a mechanical or chemical agent applied to the surface of the enamel has any influence whatever on the pulp or can bring about any stimulation or increased activity in this organ. It is a fact well known to all who have made extensive studies of the teeth under varying conditions, that stimulations of the dental pulp from without manifest themselves in the formation of secondary dentin and in an increased translucency of the dentin corresponding to the part of the tooth acted upon. We find, however, that with few exceptions neither the wearing down of the enamel cusp nor the chemical disintegration of the enamel results in any reaction on the part of the underlying dentin until the destruction of the enamel has advanced well toward or reached the surface of the dentin. If we wish, accordingly, to bring about a solidification of the hard structures of the teeth by massaging the external enamel surface we shall be obliged to keep up the rubbing until we have worn away a considerable portion of the enamel, which of course is as impracticable as it is undesirable. Moreover, the massage of the tooth accomplished by rubbing the surface of the enamel once a month with an orange-wood stick is an insignificant quantity compared with the natural massage which the tooth undergoes three times a day in the process of mastication. Furthermore, whatever influence we are able to exert upon the development of the teeth through the physical character of the food results not so much from the action upon the pulp through the crown as through the pericementum and the vascular tissues about the root, the repeated impacts upon the pericementum being of the nature of a gymnastic exercise and determining an increased flow of blood and an increased vital action of the soft tissues of the tooth.

It is also a question to my mind whether it is advisable by excessive use of pumice to rub away the enamel cuticle at points of the tooth which are susceptible to decay, as I have found that the destruction of this membrane involves an increase of susceptibility of the tooth to decay. While, therefore, all measures tending to bring about more systematic and thorough care of the teeth are highly commendable, the excessive use of pumice is to be avoided, and the attempt to induce solidification of the tissues of the tooth by rubbing the surface of the enamel with a wood point is probably futile.

The use of chemical agents, and more especially the method of employing silver nitrate in the treatment of caries of the teeth, as recommended by Stebbins in the *International* for October, 1891, is probably known to every practitioner in dentistry. Stebbins limited this remedy to cases where caries had already begun, whereas Frank recommended that it be employed not only therapeutically but prophylactically. He painted the sound neighbors of diseased teeth, as well as the sound teeth in general of children in families liable to extensive caries. He also treated the margins of cavities with silver nitrate before filling, especially at points where recurrent caries might be expected. Even wedge-shaped defects (abrasion, erosion, denudation) may, according to Frank, be brought to a standstill by the application of this agent. Frank was exceedingly enthusiastic in the recommendation of the nitrate for prophylactic purposes. Likewise Bryan (DENTAL DIGEST, March, 1904, p. 323) is an ardent exponent of silver nitrate as a prophylactic remedy.

Although thus enthusiastically recommended, silver nitrate enjoys but a very limited use either as a prophylactic or therapeutic agent, so much so that all of my endeavors to secure material for examination have thus far proved in vain with the single exception of one tooth kindly sent me by Dr. Bryan. It was chiefly in consequence of the communication of Dr. Bryan above referred to, presented at the congress at Madrid, April, 1903, that I was induced to undertake the experiments now to be considered.

The questions which call for an answer are the following: (I) *Does silver nitrate protect the dentin against the action of acids, and in what way?* Pieces of ivory were treated with a con-

centrated aqueous solution of silver nitrate, which was allowed to act for a few minutes to twenty-four hours. The pieces were then suspended in fermented solutions of peptone-sugar-bouillon or of sugar and saliva. After periods of time ranging from two to eight days they were taken out and sections were made passing through the point where the nitrate had been applied. A marked protective action on the part of the nitrate was shown. In continuation of this experiment human teeth were treated in a similar manner. The result was much the same, though not always so pronounced. As a rule the protection offered by the nitrate was most evident where the surface of the dentin had been slightly decalcified before the application was made.

A section of a tooth was made which had two superficial approximal cavities. One of them was very thoroughly bathed in a concentrated solution of silver nitrate, the remedy being allowed to act over night, and the tooth was suspended in the solution, where it was left for five months, the treatment being repeated every month. At the end of the time it was found that the decalcification in the cavity treated with the nitrate had made but very slight progress, whereas in the other it had gone on and finally reached the pulp. It should be noted, however, that the treatment was much more thorough than is accomplished in practice.

In all over fifty experiments of this kind were carried out under varying conditions, the treatment in all cases being more intense than is arrived at in practice. As an example of the method of treatment, teeth were suspended for five days in a fermented sugar-bouillon solution in order to produce a superficial decalcification, then superficially dried and painted with a concentrated aqueous solution of silver nitrate, allowed to dry again for an hour in the air, and then reimmersed in the bouillon. After twenty-four hours the above treatment was repeated, the teeth on drying then showing an intensely black spot where the application was made. They were next suspended in the sour solution and allowed to remain for four weeks, when they were taken out, again treated with silver nitrate, and reimmersed. At the end of three months the teeth were finally removed from the solution and sections were ground passing through the spot where the application was made. Sometimes whole teeth were used, some-

times halves or sections about 1 mm. thick. Sometimes the sections were made parallel to and sometimes at right angles to the dentinal tubules. The solutions were renewed from time to time during the experiments, which extended over periods varying from a few days to several months.

The results obtained confirm the impression which generally exists that silver nitrate applied to cavities of decay has a more or less pronounced effect in arresting the progress of the disease. The protection offered is naturally only partial, and varies in degree in different cases. Occasionally the nitrate failed completely to exert any protective action, as was observed in a few of the cases where the treatment was applied to the neck or root of the tooth. I was not able to find any reason for this exceptional action.

The question here arises: How does the silver nitrate effect the protection of dentin against acids? The most natural explanation seems to be that the precipitate of metallic silver in the superficial layers of the dentin forms a barrier more or less impermeable to acids. To put this supposition to the test the tissue treated with the silver nitrate was kept in the dark so as to prevent the reduction of the nitrate from taking place. Naturally no discoloration of the surface treated was produced in this case. The protective action, however, remained the same, and thereby the untenableness of the above explanation seems to be sufficiently proved.

As a second possible explanation the idea suggests itself that the protective action of the silver nitrate is due to a coagulation of the contents of the dentinal tubules. Microscopic sections present appearances which support this view, although they do not definitely prove it. Further evidence in favor of it is given below.

In order to prevent the unsightly discoloration of teeth treated by silver nitrate, I first soaked the tooth in a concentrated solution of common salt, then applied the nitrate in the usual way, and the salt solution again—the idea being to obtain a precipitate of the insoluble chlorid of silver in the superficial layers of dentin. The attempt succeeded, and no discoloration took place. Unfortunately, however, teeth treated in this way showed no increase of resistance to the action of acids. This agrees with the conclusion arrived at above that the protection afforded by the silver nitrate is not due to the formation of an insoluble inorganic precipitate in the tubules.

Among other salts of silver the argentum, colloidale and protargol were tested as to their protective action. The results were completely negative.

(II) *Does silver nitrate act by stimulating the dentinal fibrils and through them the pulp, thereby causing a solidification of the dentin and opposing a barrier to the progress of caries?* A priori, I am much inclined to doubt that any medicament applied but a few times to the surface of the enamel affects the pulp in any way whatever, and this view is completely in harmony with well-established facts. We know that the enamel possesses the power of transmitting irritations to a *very* limited degree only, and may become almost entirely disintegrated chemically without the underlying dentin being affected in any way whatever.

The only material for examination at my disposal was the tooth presented by Dr. Bryan, which, although the silver nitrate had been applied directly to the softened dentin, showed no evidence of any reaction on the part of the pulp, especially no deposition of the secondary dentin and no solidification of the primary dentin such as manifests itself in the presence of zones of increased transparency. It is possible, however, that the pulp may have been dead in this case.

After presenting this paper Mr. W. C. Grayston kindly handed me four teeth which had been treated in the mouth with silver nitrate. Two of them were deciduous molars, the roots of which were completely absorbed, from which, in connection with the general appearance of the teeth, I infer that they were in a perfectly normal condition at the time they dropped out. The other two were bicuspids with superficial caries extending around the necks; in these also the pulp seemed to have been in a normal condition. Sections of these teeth, stained with picrofuchsin, showed in some parts an apparent arrest of decay. In the two deciduous teeth and in one surface of one of the bicuspids there was a layer of softened dentin about ½ mm. in thickness beneath the totally blackened layer which had become impregnated with the nitrate. Whether this softened layer formed subsequent to the treatment with the nitrate or was present at the time of the treatment and did not become penetrated by the nitrate it is impossible to determine. At all events the teeth indicate a marked arrest in the progress of the decay, and the fact that the deciduous

teeth remained in a perfectly healthy condition until their natural time of service had completely expired is sufficient evidence of the success of the treatment. In all of the teeth a formation of secondary dentin had taken place, but as we usually find such formations in case of chronic caries, it is impossible to say in the present instance whether it be due to the direct action of the silver nitrate or is simply a result of the chronic condition of the caries. We may say, however, that the silver nitrate tends to induce a solidification of the dentin and formation of secondary dentin, in as far as it converts an acute into a chronic caries.

Protective action of silver nitrate upon the enamel.—The reasonableness of treating sound teeth with silver nitrate as a preventive against caries is based upon the supposition that it affords a protection to the enamel against the action of acids. It accordingly became necessary to test this supposition experimentally:

(1) Sound teeth whose enamel surfaces had been painted in alternating zones were subjected to the action of 2 to 5 per cent solutions of hydrochloric acid. The time required to break up the union between the enamel cuticle and the enamel was not prolonged in the zones which had been acted upon by the nitrate.

(2) Sound teeth treated in like manner as under (1), until black bands or spots had formed upon their surfaces, were subjected to the action of weak organic acids, obtained by the fermentation of sugar-bouillon solutions mixed with saliva, for periods varying from a few days to several months. Sections made at the close of these periods revealed the fact that the nitrate had offered no demonstrable protection to the enamel, and that the acid had attacked the blackened surface as readily as the parts which had received no treatment.

These results leave much room for doubt as to whether the advantages gained by the use of silver nitrate for prophylactic purposes (if there be any at all) are sufficient to offset its very considerable disadvantages, both its escharotic and poisonous properties as well as the discoloration produced by it.

Protective action of paraffin, tannic acid, etc.—Pieces of ivory which had been superficially decalcified were dehydrated in absolute alcohol, dried, and dipped in a warm solution of paraffin in chloroform. The paraffin simply adhering to the surface of the ivory was rubbed off, as it naturally would be in the mouth,

and as only the paraffin which had really penetrated the tissue could be relied upon to produce any protective action. These pieces were then suspended along with others similarly treated, minus the paraffin, in solutions of weak organic acids. The result of this impregnation was to produce a marked arrest in the progress of the decalcification. I shall await the results of the treatment of freshly-extracted teeth before giving any opinion as to the advisability of experimenting with paraffin in practice. The necessity of dehydrating the tissue and keeping it perfectly dry during the application of the paraffin will very seriously interfere with its use.

I also tested oil of cinnamon, alcohol, zinc chlorid, mercury bichlorid, and tannic acid in respect to their possible protective action upon the dentin. Pieces of ivory were superficially decalcified by exposing for two days to the action of ½ of one per cent solution of lactic acid, and then suspended for twenty-four hours in the solution whose action was to be tested; one piece, to serve as a control, being suspended during the same twenty-four hours in water. They were all reimmersed in the ½ of one per cent solution of lactic acid, where they were left for eight days. At the end of this time the decalcification had made about the same progress in all the pieces, and in no one could I detect a particular arrest of the process as compared with the piece which was used as a check.—*British Dental Journal.*

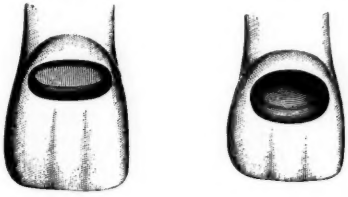
DIFFERENCES IN THE PREPARATION OF CAVITIES FOR FILLINGS AND FOR INLAYS.—By C. N. Johnson, L.D.S., D.D.S., Chicago. Read before the Connecticut State Dental Association, at New Haven, April 18, 1905. The introduction of inlay work as a means of saving the natural teeth has furnished a new problem for the dentist to solve in the way of formulating a proper system of cavity preparation for this class of work. It cannot be expected that operators who have for years habituated themselves to the study of the principles involved in the preparation of cavities for fillings will be able immediately to readjust their point of view sufficiently to approach the preparation of cavities for inlays to the best advantage, and it is confidently believed that this is one of the reasons why inlays have not

been more successful, even in the hands of those who have been most enthusiastic in their use.

It is the purpose of the present paper to point out some of the differences in the details of cavity preparation for fillings and for inlays, to be illustrated by cavities cut in tooth-forms of natural size, the one cavity for a filling, the other for an inlay. The aim is not so much to show cavities of typical or ideal form as to demonstrate the general differences in cavity formation for the two methods in similar locations. Neither is it claimed that in the minutiæ the cavities here exhibited are perfect in outline or in principle. Teeth vary in form and in their manner of decay, and the problem must be met in each individual case according to the necessities presented.

The one distinctive feature to bear in mind always is that a cavity for a filling should be of such a form that the filling when

FIG. 1. FIG. 2.



inserted cannot be lifted out of it, while the requisite of a cavity for an inlay is that the completed inlay may be inserted and removed at will. The first thing for the inlay-worker to learn is that the cavity must be widely extended at the orifice, and no man can successfully insert inlays without the will to freely sacrifice tooth tissue in many instances. The next thing to learn is that a mere saucer-shaped cavity with little depth relatively to its width cannot be depended on for the retention of inlays. The impression is too prevalent that the adhesive properties of cement are all-sufficient for retaining inlays without appreciable penetration of the inlay into the structure of the tooth. An inlay must have some body to it to remain securely seated in a cavity when subjected to stress, and it should so dip down into the tooth that it cannot be easily rocked or tilted by pressure on either side, even before any cement has been used to seal it. The lateral walls of the cavity cannot of course be undercut or even perfectly parallel,

on account of the impossibility of removing a matrix fitted into such a cavity, and yet they should not be made to flare so widely from the base to the orifice as we frequently see them.

For fillings we believe the best results are to be obtained by joining the walls of cavities with angles—for instance, the axial or pulpal wall should be joined to the surrounding wall with a sharp right-angle—but for inlays the general plan must be one of curves. If angles are used at all they should be obtuse and not sharp except in cases where the matrix may be lifted bodily away from the angle. It is the difference between the use in a cavity of an inverted cone bur and a round bur—between a hoe or hatchet excavator and a spoon excavator.

In the labial cavities in central incisors herewith submitted for your inspection, you will notice that the one for a filling (Fig. 1) has a sharp right angle between the axial wall and the entire

FIG. 3.

FIG. 4.

surrounding walls of the cavity, and that a filling properly adapted to such a cavity could not be dislodged short of breaking either the filling or the walls; while the one for an inlay (Fig. 2) has diverging walls with an obtuse angle between the axial and surrounding walls. From such a cavity a matrix for an inlay may be lifted without distortion, and yet it will be noted that provision is made for appreciable bulk to the inlay, and no thin margins such as would be present in a saucer-shaped cavity. The axial wall also presents a flat seat for the inlay to rest upon, although the area of the axial wall is not so great as the cavity at the marginal outline.

In the two approximal cavities in incisors where the incisal angle is involved, requiring a contour restoration, the one for a gold filling (Fig. 3) is prepared with decided angles in the gingival region—the gingival wall being carried somewhat labially and lingually to widen it and produce a dovetailed effect. At the ter-

mination of the anchorage step there is also an angle with a slight depression rootwise, to form an interlocking of the filling. The labial plate of enamel is shortened somewhat on the incisal edge to admit of a small amount of gold being built over it for protection to the enamel. In the use of gold in these anterior teeth the exposure of the filling material becomes a matter of careful consideration, and in the protection of enamel it is often found that a thin layer of well-condensed gold is sufficient. This can never be said of porcelain, and while we are considering in a broad way the preparation of cavities for gold inlays as well as porcelain, the call is almost universally for porcelain in these anterior teeth, and when that is used there can be left no thin edges for protection. Porcelain demands bulk for strength.

It will be seen that a filling adjusted to this cavity could not be removed short of breakage, and so it is not adapted to inlay work. There are two methods to be used in preparing such a cavity for

FIG. 5.

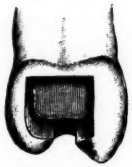


FIG. 6.

an inlay—either to cut away the incisal portion of the labial as well as lingual plates of enamel, creating an L-shaped inlay reaching part way across the end of the tooth, with appreciable thickness of porcelain at this point, or else to prepare the cavity as indicated in the model (Fig. 4), by leaving the labial wall standing to the extreme incisal end, and cutting away the lingual very freely to arrange for bulk to the porcelain in this region. It may be argued that this form of preparation provides little retention to the inlay from dislodgment under pressure toward the lingual, but most of the ordinary stress against such an inlay comes from the lingual toward the labial, and it would be difficult to dislodge the inlay in this direction. Not only this, but an inlay set in such a cavity under pressure, with a good cement which does not shrink, will stand considerable stress toward the lingual—enough at least for all practical purposes, as has frequently been demonstrated in the mouth.

In the approximo-occlusal cavities in the bicuspids the one for a filling (Fig. 5) is marked by sharp angles between the axial and gingival walls, and also at the junction of the axial with the buccal and lingual walls. There is a sharp point-angle in the gingivo-axio-lingual and gingivo-axio-buccal regions, giving a distinct mortised or dovetailed effect to the approximal portion of the cavity. In the anchorage step in the occlusal portion the floor is perfectly flat, with an angle between it and the surrounding walls of the step. The step terminates in an abrupt perpendicular wall, while the width of the step bucco-lingually at this point is greater than it is midway between the cusps. All of these interlocking forms are advantageous in the retention of a filling and tend to its most secure anchorage, but an inlay would be altogether unmanageable in such a cavity.

It will be noticed that the cavity for the inlay (Fig. 6) in the other bicuspid has been extended very much wider bucco-lingually at the occlusal surface than the one for the filling, and the general scheme of angles has been abandoned. The walls join each other on short curves rather than angles, and the cavity, while rather deep, is of such a form that a matrix for an inlay could be fitted to it and removed without distortion.

These are the chief differences to be noted in preparing cavities for fillings and for inlays in the three classes of cavities illustrated, and they embody in a general way the differences in all classes. There are other distinctions in some of the minor details which will be readily apparent to every operator, such, for instance, as the greater liberty in beveling and overlapping thin enamel where gold inlays are used than for fillings. Melted gold of 18 or 20 karat will be stronger to given bulk than a malleted filling, and it can be beveled to thinner margins with greater safety. But in these details each operator's judgment must suffice. It is only with the broad question of general cavity formation in a few of the different classes that the present paper has to deal.—*Cosmos.*

NECESSITY FOR THE PRESERVATION OF THE PULP, WITH SPECIAL REFERENCE TO THE STRUCTURAL INTEGRITY OF THE TEETH. By Charles S. Moore, D. D. S. Read before the Pennsylvania Association of Dental Surgeons, January 10, 1905. It is generally recognized

that a devitalized tooth is, for various physiological, pathological and mechanical reasons, less able to perform its functions than a vital tooth. It is the purpose of this paper to treat of the latter phase, with such anatomical reference and allusion as may be necessary to study the comparison of the normal with the altered condition. The factors which confine and modify our thought to this feature of the general considerations governing conservative treatment of the pulp are, first, the study of the structure of the normal tooth, with a view of locating the weakest parts under the force of mastication; second, the altered condition when the tooth is opened sufficiently to permit of thorough access to the pulp-canals; third, such methods of entrance into the pulp-chamber and canals as may with least danger to the tooth permit of free access to the chamber.

FIG. 1.

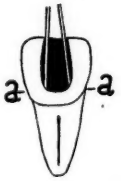


FIG. 2.

FIG. 3.

If it were possible to reach all teeth with equal facility, and if all the posterior teeth were of the same anatomical form, the simplicity of formulating a definite plan of procedure would be evident; but as such conditions are far from being those confronting the operator in this work, the general plan is impossible, and such variations as may suit the particular case are usually necessary.

In extirpating the pulp in the incisors, cuspids, or bicuspids the amount of tooth tissue lost in proportion to the size of the crown is less than in the molars for two reasons: first, having but one or two roots, the chamber is smaller and the path of entrance is accordingly small; second, because of their more anterior position the manipulation of instruments in the canals is possible with a smaller opening. It therefore seems reasonable to assume that the molars are far more subject to impairment as a result of this procedure than the teeth anterior to them, and it is to the consideration of the altered condition of the former that this study is directed.

There is yet a further specialization in regard to the position on the surface of the tooth where the cavity causing the exposure is situated. If the defect is upon the mesio-proximal surface a minimum of dentinal structure is lost in obtaining an entrance to the pulp-chamber and canals; if upon the occlusal surface at the intersection of the transverse and longitudinal grooves of the lower molars, or in the mesio-buccal groove of the upper molars, a greater amount of dentin is lost by the ravages of caries and necessary cutting from the roof of the chamber to the occlusal surface, and the tooth is probably weakened to a greater extent. Exposures on the buccal or lingual surfaces require new entrances through the mesial or occlusal surfaces, and the teeth in such cases are weakened in proportion to the amount of tooth tissue removed.

But it is to cavities complicated by pulp-exposure situated upon the disto-proximal surfaces of the molars, and the treatment in those situations for pulp-removal, with the consequent loss of tissue, that I would call your attention, as also to the sketches shown in illustration. As diagrams are inaccurate, the conclusions we may draw from them are to be modified by the degree of their inaccuracy, but they at least suggest the concern we may feel for the teeth which are so treated as the illustrations show.

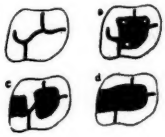
I have no data to substantiate the assertion that devitalized teeth are more subject to fracture, and while a keenly observant member of the dental profession expressed himself as not at all in harmony with this suggestion, yet from clinical observation since this subject has been in mind I believe such to be the case. Dr. Louis Jack, in the "American Text-Book of Operative Dentistry," remarks: "A further reason for maintaining the vitality of the dentin is that when the pulp becomes devitalized the loss of cohesive force which occurs as a consequence leads sooner or later to the fracture and early loss of the tooth." If, as a working hypothesis, we assume that the devitalized tooth is more prone to fracture than the vital one, we include the factor of the weakening of the tooth by a loss of dentin due to the ravages of caries (which was instrumental in the death of the pulp), and such further loss of structure as may have been necessary in the process of removing the pulp and filling the canals.

Now, while recognizing the various other important reasons for

the preservation of the pulp, it is my purpose to deal with this latter mechanical aspect of the situation only, and to show diagrammatically the weakening of the crown in the cases mentioned. There are closely associated with the amount of tooth structure lost, the age and the quality of the tooth, but as these two clinical factors do not modify our line of thought, no consideration need be given them other than the mention of their importance.

For the purpose of making sections from which Figs. 1 and 2 were made, perfectly sound teeth were selected, so that in preparing an entrance into the canals the least possible amount of tooth tissue should be cut away. It is therefore reasonable to believe that the loss where extensive decay has occurred is much greater than here indicated. The figures show the maximum thickness of the walls when the minimum of tooth structure is lost; they emphasize the danger of perforating the tooth while working in this region, and point out the necessity of an intimate

FIG. 4.



knowledge of the internal anatomy of the tooth, to avoid such an accident.

It must be admitted that the study of the exterior of the tooth is essential, but its importance is of relative value only. As the general surgeon, with his intimate knowledge of the various organs situated near the shoulder, or the chest, or the loins, is enabled by means of these external points to accurately reach the desired hidden parts, so should the dental surgeon in his efforts to reach the deeply-hidden and vital portions of the tooth—i. e., the pulp-chamber and pulp-canals—be guided by his knowledge of the relation these parts bear to the tooth-crown, otherwise irreparable damage may be done. To one of many years of observation the importance of this may not be felt; his long experience has enabled him to acquire an intimate knowledge of tooth form; but how many teeth were sacrificed before he knew accurately the relation of the parts! In the acquisition of this knowledge

the model is a valuable adjunct, but the actual examination of the parts and their dissection are of greater importance to the student in photographing upon his mind the interior anatomy of the teeth as he views them in their natural positions.

In Fig. 1 I have endeavored to show the loss of tissue a molar tooth sustains when an opening is made to the pulp-chamber from the occlusal surface. The section is a transverse one, passing from the buccal to the lingual side of the tooth between the anterior and posterior roots. It will be noticed that the lines of force in lateral occlusion are directed against a portion of the tooth where fracture frequently occurs, namely, at the junction of the crown with the root, the points marked a, a in the diagram. In the sound tooth this portion is reinforced by the thickness of the tooth from the vault of the chamber to the occlusal surface. If, however, as is sometimes done, a cavity is cut in the anterior portion of the occlusal surface in the longitudinal, and anterior to the transverse groove, there is left an arch of supporting dentin which to some extent reduces the strain at the cervix.

In the lower molars it is more difficult to reach the anterior canal or canals through an opening sufficiently small to retain this supporting arch than it is in the upper ones, for the broach must be directed at a greater angle posteriorly in the former than in the latter.

Fig. 2 shows an antero-posterior section of a lower molar through roots and crown in which the supporting arch of dentin and enamel is shown between the two broaches, while in Fig. 3 it is cut away, illustrating the large amount of dentin lost from the distal in the mesial direction. This section also calls attention to the very small mesial wall that is left when the entrance from the occlusal surface to the chamber is made. This wall is a frequent spot for caries, and it will be noticed that if this part is affected the only connecting frame between the buccal and the lingual walls is lost.

An idea of the force of mastication when stated at seventy-five pounds is somewhat indefinite, but a tangible impression is conveyed to the mind by the tremendous power that burnishes down gold fillings which have not been sufficiently reduced to accommodate the bite. If any filling is inserted, except possibly cement or an inlay, it may "flow" under this force, and if so

actually serves as a wedge to pry the two halves apart. It seems reasonable to suppose that the intervening arch may lessen this danger by reducing the bulk of the filling in addition to connecting the two sides.

Fig. 4 shows four views of the occlusal surface of an upper right molar. In a the outline and grooves are shown; b indicates the relative position of the pulp-chamber and the pulp-canals in the three roots. This diagram illustrates the possibility of a ready access to the canals through a cavity made at the intersection of the mesial, buccal, and oblique grooves. It is rarely necessary in the upper molars to cut across the crown from the distal cavity to this point in order to obtain a suitable opening to the chamber. For this reason it is possible that the extent of tooth structure lost in the extirpation of the pulp from one of these teeth will be less likely to weaken the crown than the same operation in the lower teeth.

If it is necessary to continue the distal cavity anteriorly to the intersection of the mesial, buccal, and transverse grooves, a very small amount of the tooth is left remaining of the disto-buccal lobe, and it is prone to a complete fracture along the line of the disto-palatal groove, as is shown in d.

As has been previously mentioned, the inaccuracy of diagrams discounts their value as illustrations, and it is only by means of a study of sections of teeth properly prepared that one will be impressed with the danger of weakening the tooth in the ordinary process of pulp extirpation. The treatment of the subject in this paper is merely a suggestion along such lines. I have endeavored to show, however, that by preserving the vitality of the pulp, in addition to the decided advantages its vitality assures, we are maintaining the tooth's structural integrity.—*Brief.*

SUCCESS AND FAILURE IN OPERATIVE DENTISTRY. By Frank L. Platt, D.D.S., San Francisco. Read before the Fourth International Dental Congress, at St. Louis, 1904. Operative dentistry may be defined as embracing all that portion of dental science not concerned in the replacement of the loss of the natural teeth or the correction of their irregularities. For the purposes of this paper, however, the subject will be confined,

so far as success and failure are concerned, to the ordinary and most frequently performed operations of dental surgery.

To properly define failure in any undertaking or application of science it first becomes necessary to decide what constitutes success, for when this has been determined failure is simply its antithesis.

The fundamental object of operative dentistry is the conservation of the natural teeth, either by prophylactic, hygienic and therapeutic measures, or the replacement of lost tissue with crowns or fillings. The scope and purpose of operative dentistry being defined, we come at once to the consideration of what constitutes a successful operation.

The teeth under normal conditions, as evidenced in animals and savages leading a natural life, were no doubt primarily intended to perform their various functions throughout the life of their possessor, but as we are considering the teeth of civilized man allowance must be made for the degeneracies resulting from the habits, customs and institutions of our civilization, for we have so far departed from natural modes of living that few individuals reach the age of maturity, and fewer still reach middle life or old age, without suffering the loss of one or more teeth as a result of dental disease, or without having had recourse to operative dentistry in one or more of its various branches. As it is impossible for the human race to revert again to savagery, or to recover at once its earlier vigor and freedom from disease, so it is equally impossible to remove by any operation the primary cause of degenerate and diseased conditions. We may successfully remove the local and exciting causes of dental disease, or replace with substitutes lost dental tissue, but as we cannot change or modify the diathesis which is the predisposing factor in each individual instance it is only logical to assume that the cause which first led to the disease may cause its recurrence. So, while it is quite possible that the predisposing cause of dental disease may be combated, and in a measure overcome by a continuous course of prophylactic treatment, it is not fair to say that dental operations should last indefinitely, nor is it just to assume that a given operation performed on different patients will give uniform results, for there must always be taken into consideration the predisposing personal diathesis, and also the habits, occupation, temperament

and age of each individual, and the circumstances and conditions governing its performance. As there are, however, certain objects to be attained in every dental operation, such as the relief of pain and the restoration of the usefulness and appearance of the teeth, a successful dental operation may be defined as one which under given conditions is productive of the most nearly ideal results in each individual case.

Under this definition there is at once presented to the mind of the careful, conscientious, thoughtful operator a vast field of study relating to the general and local conditions governing each case presented for treatment, and including the selection, preparation and use of materials, the condition and adaptability of instruments, and the results it is hoped to achieve by operative procedure. All these considerations are essential to the successful practice of dentistry, and the operator who slights any of them, or adopts methods of empiricism, will sooner or later find he has been courting defeat and failure.

Much has been written on the bacterial origin of caries, on chemical action in the oral cavity, and the effects of habit and environment, but there is another point from which the failure of operations may be viewed, a point with which the dental profession has much to do and which reveals a state of affairs as deplorable as it is unnecessary. Every profession, trade, or general occupation is governed more or less by precedent, but there is no reason why the dental profession should adhere as tenaciously as it does to the unhappy precedents established in its earlier days or which have resulted from the unfortunate application of the rules of trade to a profession which should never have known their influence. The standard of value for dental services should not be fixed, as it too often is, by the cost of the materials employed, but should be in accordance with the actual results of the service rendered and the amount of time and skill required in its performance.

Experience, experiment, and scientific study have established rules for the preparation of cavities, the general principles of which are correct; filling materials have been the subject of countless experiments, and their virtues and failings carefully determined; instruments in almost endless variety have been devised for the preparation of cavities and the insertion of filling materials; calca-

reous deposits on the teeth have been the subject of much study, and their origin, chemical constituents, effect on tissue, and removal have been taught and illustrated extensively; artificial crowns in great variety and of varying value have been devised, and their manufacture and application have been freely given to the profession; pulp-cavities have been treated and filled in countless millions, by numberless methods and with an endless variety of materials, and the history, development and application of all these things is free and easily accessible to anyone who will read dental literature. When many men of many minds are interested in a common pursuit there will of course be a diversity of opinion regarding the best means of reaching a desired end, but as to the object to be attained and the general principles governing its accomplishment there is usually but little room for argument. Under such conditions it is reasonable to expect fairly uniform results from the operations of men specially trained and educated in all the principles and intricacies of dental surgery, yet our daily experience must lead us to believe that something is lacking in the system of operative dentistry as it is practiced to-day, for it is undoubtedly true that a large portion of the time of the average practitioner is spent in remedying the untimely failure of operations performed by himself or his contemporaries.

Leaving unconsidered the work of those who fasten their faith on a single method or material, for they are too hopelessly conservative to demand attention in a liberal age, we may study with interest the conditions presented in the mouth of an average patient who has suffered from a variety of dental ills and at the hands of a number of different operators. Here we may find a few fillings of gold or amalgam to which the patient points with pride as he says, "Old Dr. A did that work fifteen years ago, and I guess it's all right yet," a supposition which an examination proves to be correct. We will further find that the cavities in which these fillings were placed were well prepared, perhaps not just up to the latest ideals of "extension for prevention," or the "prevention of extension," as the case may be, but with firm, smooth margins extending to the extremities of the fissures and compassing all that portion of the tooth involved by caries. We will find also that the fillings were well condensed, a feature which is essential to either gold or amalgam, and they were also well finished.

Further conversation may develop the fact that "The old doctor charged an awful price for his work, but I guess it was worth it," all of which is food for thought as we continue our examination and find gold, amalgam and oxyphosphate fillings undermined with decay, with rough surfaces and overhanging edges, in imperfectly prepared cavities whose margins have not been sufficiently extended, and from which the carious dentin has not been thoroughly removed. We may also discover an ill-fitting crown, perhaps brazenly proclaiming its presence on an incisor or cuspid, and we will undoubtedly find between the upper molars and on the lingual surfaces of the lower teeth rich deposits of calcareous matter and the usual debris of the oral cavity. Inquiry will reveal the fact that the teeth have not been cleaned for many months or even years, though several operators may have been consulted regarding other matters, and that most of the work has been hurriedly and cheaply performed and very obviously with no regard whatever for the established principles of cavity preparation and the proper selection and manipulation of tooth-conserving materials. The patient will also be found to be almost totally ignorant of the methods and materials to be employed in the proper daily care of the teeth and of an intelligent appreciation of the true value of the various services which have been performed.

This is no idle picture, but one with which all of us are familiar, and it certainly does not bear out the frequent boast of the "wonderful progress" of dental science. The conditions enumerated disclose the fact that the operations which succeeded were performed by a careful, conscientious operator, who demanded and received a fee commensurate with his skill and his integrity, and which permitted him to do the work as well as he knew how, while those which failed were executed by those who prostituted their art, their knowledge and their skill to the god of mammon, and who signally failed in their duty to their patient, their profession and themselves.

It is not the lack of well-established theory or the fact that dental education is difficult to secure, nor is it always the lack of understanding which leads to failure, but it is a lack of moral courage and professional integrity, a lack of sufficient will power to overcome the evil precedents seemingly engendered by an unholy thirst on the part of the public for something cheap and of an equally unholy willingness on the part of the profession to give it to them.

Success cannot be universally attained, nor failure everywhere prevented, but the present condition of too-prevalent failure may be modified by teaching our students and the members of our profession not alone the correct principles of operative dentistry, but also the importance of educating the public to an intelligent appreciation of the actual value of skilled services and the part they must take in the care and preservation of their teeth, and above all our colleges, our societies, and our journals should teach that success, intelligence and integrity walk hand in hand, while failure, falsehood and deceit are spirits of evil bound together by inseparable ties.—*Cosmos.*

THE MAXILLARY SINUS AND ITS DISEASES. By Thomas L. Gilmer, M. D., D. D. S., Chicago. Read before the Illinois State Dental Society, at Moline, May, 1905. The intramural air sinuses are cavities in the bones of the face and head, and are called the frontal, ethmoidal, sphenoidal and maxillary. Each of these is surrounded by bony walls of greater or less thickness and each is accessory to the nasal fossæ. The maxillary sinus or antrum of Highmore is the largest of the group. These sinuses are lined with mucosa, which is continuous with that of the nasal fossæ, and the mucous membrane of the former differs from that of the latter only in that it is less vascular and therefore weaker and less able to resist injury and infection. The nasal fossa may withstand a serious inflammation and speedily regain its equilibrium, while an injury or pathological condition of the same extent in the maxillary or other sinuses if not treated would keep them from resuming a healthy condition from the fact that their lining is less vascular. Eckley says that "The antrum is formed by an evagination of the nasal pit about the sixth month of fetal life, and is lined by a delicate, loose, flabby, detachable and poorly nourished mucous membrane, continuous with that of the nose through the nasal orifice."

The antrum is variable in size, being smaller in the female than the male, and having a capacity from three to eight drams according to the best observers. When we understand the relationship existing between the nasal fossæ and the intramural sinuses we readily see how any one or all of them through continuity of tissue may be involved in disease originating in the

nasal fossæ. We can also understand how the antrum may be involved in disease through a purulent discharge from either the frontal, ethmoidal, or sphenoidal sinuses finding its way into it. The studies of Fillebrown and Cryer have demonstrated that through abnormal anatomical development the frontal sinus occasionally communicates directly with the maxillary sinus. Therefore when the frontal sinus is involved in suppuration pus will be discharged from it into the maxillary sinus. This fact must be borne in mind in seeking for the cause of purulent secretions found in the antrum when the etiology is obscure, and the history of each case should be critically examined to discover the origin of the disease. If the history shows that at the onset of the symptoms there was a severe alveolar abscess at the root of an upper bicuspid or molar, with a chronic suppuration following, we have, with frontal, ethmoidal and sphenoidal sinusitis excluded, a rather clear etiological factor established, or if following an attack of influenza there is a maxillary sinusitis, indicated by pain and a sense of fullness in this region, which does not subside when the grip attack does, then in the absence of symptoms of inflammation in the other sinuses there is good evidence of antral involvement.

The diseases to which the maxillary sinuses are subject are catarrhal or influenza infections, suppurations, cysts and neoplasms. The catarrhal or influenza involvement may be evanescent or it may pass from an irritation or mild inflammation into a suppuration. If with swelling of the turbinated bodies there is stenosis of the maxillary ostium, and a sinusitis exists in the antrum, the fluid may accumulate to such a degree as to cause much pain, with distention of the weaker walls of the sinus, namely, orbital, nasal or buccal. The pressure of the accumulated infected secretions may so lower the vitality of the already hyperemic lining as to cause suppuration of a part or all of the mucosa. Should the parts involved in inflammation be immediately over the apices of the second bicuspid or buccal roots of the first and second molars, and the ends of these roots, as is often the case, very closely approximate the floor of the sinus, then we may have death of the pulps in these teeth even though there should later be resolution in the lining membrane. The death of these pulps may result in a chronic abscess and continue the infection by discharging into

the sinus. This it would seem is a reasonable hypothesis and may account for some of the sound pulpless teeth which are found at times in the posterior part of the upper jaw.

The term suppuration is used instead of empyema because the latter does not seem applicable to the condition. An empyema is a condition rather than a disease, in which there is pus in a closed cavity, as in the pleural cavity. The antrum of Highmore is not anatomically a closed cavity since it has a natural opening in the maxillary ostium, therefore strictly speaking suppuration of this sinus can not be denominated an empyema.

Infections resulting in engorgements are most frequent during epidemics of influenza. During an attack of the grip we have as one of the initial symptoms a coryza, the influenza germ first attacking the mucosa of the nasal fossæ. This is followed by the inflammation extending through continuity of tissue to the accessory sinuses, the symptoms of which are a rise in temperature, and a sense of fullness and pain in one or both antrums and in the region over the frontal sinus. In addition to these transillumination will give a decided shadow, preventing the light showing through the eye and cheek, and this shadow in the earlier stages of the disease is the result of congestion or infiltration in the parts. In the majority of cases, with proper treatment, a sinusitis of this nature will disappear and the mucosa of these localities resume its normal state and function. If the disease is persistent and the maxillary ostium becomes closed by swelling of the turbinated bodies, the exudate becomes infected by pyogenic organisms and pus forms, when there is a degeneration of the lining of the maxillary sinus in places, with a possible periostitis and osteitis following. If the inflammation extends to the periosteum and bone the pus may burrow between and separate them, and if this condition continues indefinitely parts of the bone may die, and the suppuration is continued through presence of the dead bone. Since it is a well-known fact that disease of the maxillary sinus frequently follows an attack of influenza, this result should be anticipated and active treatment employed to prevent the entailment of this sequence.

There is a difference of opinion regarding the part diseased teeth play in causing suppuration of the maxillary sinus. By some it is thought that it is a rare exception when abscesses of the teeth

are a cause of antral disease. My experience leads me to believe that chronic suppurations of the antrum are more generally caused by abscesses from infected roots, in connection with the second superior bicuspids and the buccal roots of the first and second molar teeth, and occasionally by the teeth anterior to these, than from all other causes combined. I recently had a case in which pus from an abscess at the end of the root of a lateral incisor burrowed backward until it reached the nasal bony wall of the sinus, from which it separated the periosteum overlying, causing necrosis of the bone, the pus finally pointing in the antrum.

It is well known that the apex of the second bicuspid root and the buccal roots of the first and second molars approximate very closely the floor of the sinus. In such cases an abscess thus caused must of necessity open into the sinus, because less resistance is offered in this direction than by the bone buccally. It is a reasonable hypothesis to suppose that when the roots of the teeth before mentioned have but a thin layer of bone separating them from the floor of the antrum, a serious suppuration at the end of these roots may cause suppuration of the antrum and be continued in a chronic form indefinitely. When the roots of the teeth mentioned approximate closely the floor of the sinus, applications of arsenic for the destruction of their pulps may cause a limited necrosis which may result in suppuration in the sinus. Also the forcible application of medicaments for the disinfection of the roots of teeth, such as carbolic acid, oil of cassia, or some form of peroxid of hydrogen may result in suppuration of the antrum. The suppuration caused by the use of oxidizing medicaments is not through any destructive power of the agent per se, but through its influence in generating gas sufficient to force infectious material into the healthy tissue beyond, involving it in disease. I have seen one case of suppuration of the antrum of Highmore attributable to the use of arsenic applied for the purpose of destroying the pulp in a third molar. This tooth and the alveolar process immediately adjoining, through the influence of the drug, became necrosed and the tooth became so loose in its socket that it could have been removed with the thumb and finger. Enough bone was destroyed and thrown off to expose the posterior portion of the sinus, resulting in a serious suppuration of the whole antrum. Whether the arsenic was carelessly applied or allowed to remain too long, I do not know, but the result and its cause were evident.

I have seen a few cases of suppuration of the antrum traceable to traumatism. Not long since we had in my clinic at the dental school a case in which both antrums were suppurating as the result of a fracture of the bones of the face. The suppuration was not discovered until nearly a year after the injury.

Syphilis is said to cause suppuration of the antrum, but I have never seen a case of this kind which could be definitely traced to that disease. We often find necrosis of the palate and nasal bones as a result of tertiary syphilis, and while it would seem natural that the antrums might be an equally fruitful field of suppuration as a result of syphilis, it must be very rare, since such a careful observer as Garretson stated that after a long experience in the practice of oral surgery he never saw a case of antral suppuration which could be traced to syphilis.

Sinusitis resulting in engorgement and suppuration is by far the most common of antral diseases, still there are other pathological conditions which are far more serious in their ultimate results. Among these are neoplasms, and carcinoma and sarcoma are sometimes found here. When found in these localities they are most malignant, since they are usually mistaken for suppurations and their true nature not discovered until it is too late. I have known curetment in two instances to be made in such cases, the operator supposing a non-malignant condition to be the cause of the enlargement of the buccal wall of the sinus, which was the first visual symptom observed. This treatment naturally aggravated the disease, and the result in both cases was fatal. Metastases are rapidly produced where carcinoma invades the antrum, through the plentiful supply of lymph and venous channels. Unless sarcoma and carcinoma are diagnosed in their incipiency, the blood supply to the parts lessened by carotid ligation, and fully one-half of the jaw removed, and then followed up by vigorous X-ray treatment, there is but slight hope of prolonging the patient's life for any great period, and even with this vigorous treatment the prognosis is very unfavorable in the most malignant forms of these diseases. It is difficult at times to differentiate between growths of this nature and cysts, dentigerous and otherwise, as in each case there is bulging of the buccal or nasal walls of the sinus or both, and perhaps also bulging of the eye through lifting of the orbital plate. Cysts are usually of slower

growth and are not so generally accompanied by pain and rarely by general systemic participation. An exploration may be necessary to arrive at a correct diagnosis, and the microscope at times is the only means of giving a positive knowledge of the true nature of the disease.

It is not so difficult to differentiate between a carcinoma or sarcoma and a simple engorgement or suppuration of the antrum, since in the earlier stages of neoplasms there is no pus to be found flowing from the antrum into the nose, as is the case in suppurations, neither do the neoplasms have so sudden an onset as do the conditions resulting in engorgements. If the buccal or nasal wall of the antrum be destroyed by pressure from a growth within the sinus, and there protrudes a cauliflower-like tumor, the rational conclusion is that we have, not a suppuration or engorgement to deal with, but a carcinomatous growth. Sarcomatous growths do not, like the carcinomatous tumors, spring from the epithelial lining, but from the connective tissue beneath. There is not the same tendency in sarcoma to destruction of the nasal and buccal walls of the antrum as in carcinoma. In sarcoma the entire cheek is enlarged, bone and all. There are three varieties of sarcoma found in these localities, the round cell, spindle cell, and giant cell, and the malignancy of these is in the order in which they are given. The giant cell sarcomas when thoroughly removed rarely return or form metastases. The round-cell and spindle-cell varieties are far more formidable forms of the disease. The giant-cell sarcoma is much more frequently found in the mandible than in the upper jaw.

As before indicated, dentigerous cysts are sometimes found in the antrum, and I once had a case in which I removed nearly two hundred small denticles from the sinus. Odontomes are also occasionally found here, and I have had one case of this kind, which had grown to such a size that it almost obliterated the sinus. Impacted teeth have been discovered in these localities. Polypi are also noted in the antrum. These are polypoid degenerations of the mucosa as the result of suppuration. Pus sacs originating at the ends of the roots of pulpless teeth have been reported as completely filling the sinus. I have had in my practice one case of aneurism of the antrum. The buccal wall was greatly bulged and thinned and from the pressure on the nerves there was con-

siderable pain. This wall was opened for exploration to aid in diagnosis, and at once there spurted forth a profuse rhythmic flow of arterial blood which was not controlled until a large opening was made in the wall and the cavity packed. After the hemorrhage was stopped nothing was found in the sinus to indicate disease. It is presumable that this was an aneurism of the posterior descending palatine artery, it having reached the antrum by absorption of its walls, or it may have been abnormally placed within the sinus. No other case of aneurism has been reported, so far as I know. Had the entrance been made through the nasal wall in this case some difficulty would have been experienced in controlling the hemorrhage. Transillumination showed a heavy shadow on the affected side.

Pus in the nose is not necessarily an indication of suppuration of the antrum, as it may come from the ethmoid or sphenoid cells, or from the frontal sinuses, or all three of these sources. Pus flowing from the maxillary ostium is not necessarily pathognomonic of suppuration in the antrum, as it may have found its way into the cavity from the frontal sinus through abnormal anatomical development, as has been clearly shown by the observations as before stated. However, it is not reasonable to suppose that the mucosa of the maxillary sinus can long remain in a healthy condition if it is made a receptacle for pyogenic discharge from other sources. Sooner or later there is involvment of this sinus, which will require treatment, but it cannot be permanently cured until the original source of the pus has been found and eliminated. If pus is discharged into the nose from the maxillary ostium and there is no pain or soreness in the frontal region, and if there is a decided shadow on the suspected side when transillumination is employed, we are justified in an exploratory operation to determine the nature of the disease. In order to decide if pus in the nose comes from the antrum, dry the nasal fossa on the suspected side and incline the head in the opposite direction, when if pus is found in the nose the probabilities are that it comes from the antrum. If when the head is inclined forward pus is found in the nasal fossa, it probably comes from the posterior ethmoidal or sphenoidal sinuses. If when the patient lies on back we find that the pus discharges into the pharynx, it probably comes from the anterior ethmoidal sinus, as neither of

these positions favors a discharge from the antrum or from the other sinuses. If the exploratory operation includes a generous opening through the anterior buccal wall of the sinus, just above its floor, we are enabled to determine the condition of the antrum and generally remove the cause, if the source of the trouble lies here, but before opening the sinus we should as far as possible exclude all other sources. If accompanying or immediately following an attack of influenza there is pain in the cheek, with a sense of pressure, bulging of the buccal wall or sense of protrusion of the eye, and no discharge into the nose, it is pretty good evidence of an engorgement as a result of the extension of nasal inflammation. This may be promptly relieved by puncture in the nasal wall through the inferior meatus or through the buccal wall, followed by irrigation with non-irritating antiseptic solutions. If there is only pain and a sense of fullness in the antral region, with no feeling of fullness of the eye or distension of the buccal wall, then we should attempt a cure by internal medication to relieve the pain, and such other remedies as will tend to relieve and dry up the secretions or cause their absorption. Aspirin or phenacetin to relieve the pain, saline cathartics to relieve blood pressure and for their eliminating effects, and atropin to dry up the secretions. A good remedy for this purpose is found in rhinitis tablets (composed of quinin, atropin and camphor). This treatment should be coupled with an antiseptic cleansing internasal spray. By prompt action of this kind suppuration may be prevented, which is a probable sequence unless the early symptoms are combatted vigorously.

Suppurations of the maxillary sinus are sometimes treated by rhinologists by irrigation of the sinus through the maxillary ostium. (Cryer says a sound cannot be passed from the nose into the maxillary sinus.) It certainly would seem very difficult to reach the antrum by this means unless the middle turbinated bone be removed, and even then, if the case be one of long standing involving polypoid degeneration of a considerable area of the lining, or if there is necrosis of the bony walls, it is doubtful if a cure could be obtained by any treatment other than radical curetment of the diseased area. Some object to opening into the sinus from the buccal wall, believing this route offers greater danger of reinfection from the mouth than does the nose from

the nasal route, and even if curetment is demanded some operate through the nose, removing the nasal wall. This is possible, but the difficulties appear greater by this route than through the buccal wall, and it would seem that the nasal route affords almost if not quite as easy means of reinfection as the mouth. Then there is the danger of injuring the lachrymal duct, the difficulty of seeing into the sinus through the nose, and the difficulty of introducing the finger for exploration, all of which seem to indicate that the nasal route is a less favorable one than the buccal wall route.

In the treatment of suppurations of the antrum it is important that a view of a considerable portion of the sinus be obtained, also that an opening be made sufficiently large to permit every part of the cavity being explored by the little finger. This is the operation I generally employ if curetment is demanded, and my experience leads me to believe the fears of reinfection are not well founded. Upon examination of a skull it will be found that the anterior buccal wall of the antrum is very thin and that through it access is easily and readily obtained. To do this operation, separate the jaws and hold them apart with a mouth-gag, placing it on the side opposite the one diseased. Put a large piece of folded gauze on the affected side sufficiently posterior to prevent the blood passing into the fauces. Retract the cheek with the Black cheek-distender, then make a semicircular incision through the mucous membrane and periosteum. This should extend from the first bicuspid to the second molar convexity downward on a line with the floor of the sinus, which corresponds with the duplicature of the gum tissue and the mucosa of the cheek. The mucosa and periosteum are now separated from the bone and elevated with a periosteotome, exposing the bone. With a bi-beveled drill one-eighth of an inch in diameter, or with a trephine of larger diameter, cut directly through the thin bony wall at a point above and between the roots of the second bicuspid and the first molar, directing the drill upward and backward. Enlarge this opening upward, forward and backward with a coarse-cut fissure bur until the little finger can enter the cavity, when it may be explored by the finger and some idea of its condition obtained. If it be now packed for a short time with gauze the hemorrhage will be controlled, when with a strong light we

may make a visual examination of a considerable part of the sinus. The fear expressed by some that such a large opening may injure the contour of the face or that it may not completely close is without foundation. I have never seen a case in which the opening did not close, indeed, unless it be well packed it will close far too soon to permit treatment to be sufficiently prolonged.

The older method of gaining access to the antrum through the alveolus of an extracted molar or bicuspid is not satisfactory, since it does not, without great loss of bone and expenditure of much time, afford a sufficiently large opening. If drainage and irrigation only are the aim of the operator this method may be employed, but in such a case, unless the tooth is the cause of the suppuration and must be sacrificed, it is better either to make a small opening through the nasal wall in the inferior meatus or through the thin portion of the buccal wall. Openings through sockets of teeth have the great disadvantage that food is forced into the cavity by mastication. It would seem best in all cases, except when simple drainage is contemplated, to make the larger opening in order that we may have the benefit of thorough exploration of the cavity for diagnostic purposes. In the opening made higher up the cheek falls over it and prevents food entering.

In a few instances I have found partial division of an antrum by septa, with necrosis of parts of the bone forming these separations. These are easily discovered by the sense of touch in the finger, and may be removed since the access is large enough to reach them. I have never seen a case in which the antrum was completely divided by septa. If the sinus contains polypoid degenerations, which is almost universal in chronic suppurations, with the larger opening they may be cureted out, denuding all of the walls if it seems desirable, and I am of the opinion that the more thoroughly they are denuded in these cases the better, because it permits the cavity to fill up with healthy granulations. If the case is chronic and does not yield to palliative treatment and demands an operation, let it be on thorough and radical surgical lines. All know how unsatisfactory the results of the less radical operations are.

The after-treatment is quite as important as the operation itself. This should include thorough irrigation of the antrum daily, with at least a quart of warm, mild, cleansing antiseptic solution ap-

plied by means of a fountain syringe or irrigator. I know of nothing better for this purpose than McFarlane's Nasal Plasma tablets composed of:

Sodium chlorid	5½ grains.
Sodium sulphate	1½ grains.
Sodium phosphate	¼ grain.
Potassium chlorid	2-5 grain.
Potassium sulphate	¼ grain.
Potassium phosphate	1-3 grain.
Menthol	1-15 grain.

I doubt if the oxidizing agents, much employed in the treatment of antral suppurations, such as peroxid of hydrogen, are ever necessary, and if the opening into the antrum is small they may work untold injury. This thought is repeated as a caution to those who have not given the subject sufficient consideration. After irrigating the sinus it should be packed tightly with iodoform gauze, and this packing should be continued for at least six weeks or two months after the operation, and the irrigation continued after the packing is left off until the opening is closed. Objection is urged against the employment of iodoform gauze on account of its odor and taste, and because some persons are poisoned by its use. After having tried many kinds of gauze I return to the iodoform, since it gives far better results than the others. As to its systemic effects, I have not seen a single case of rash or delirium or other poisonous results from its use. In rare instances I have known patients to complain of slight nausea, which is probably due, not to the toxic effect of the iodoform, but to the taste. In order to get rid of much of the taste and odor the cavity may be nearly filled with the iodoform gauze and the remainder of the orifice packed with plain or borated gauze. This in a measure prevents the escape of the iodoform into the mouth.

Formerly in irrigating I used rubber or glass points connected with the irrigator, but now employ with greater satisfaction a small soft rubber tube connected to the larger tube of the irrigator. This being flexible causes less pain in introduction and can be directed easily so as to wash out all parts of the cavity. In some instances I have closed the end of the tube and punched holes in it, so as to direct small streams in all directions. The irrigator should be

elevated sufficiently that the solution may be sent with considerable force to all parts of the sinus.

I do not employ plugs or tubes in openings following radical operations for suppuration, as I do not believe they are ever necessary and they may be positively injurious in some instances by causing irritation. No tube can be fashioned to afford positive permanent drainage, and same are permissible only in some cases of simple engorgements due to catarrhal affections for irrigation, and then a soft-rubber fenestrated tube should be employed. If access to the sinus be had as indicated the cheek falls over the opening, as before stated, closing it so that when the packing is discarded food and other matter does not easily enter the cavity.

In order that a visual examination of the sinus may be had during treatment subsequent to the operation a small pea lamp with long insulated wire connections may be introduced and the progress of the case watched.

If the roots of a tooth or teeth enter the antrum I am of the opinion that they should be sacrificed, as they hazard the good results which may reasonably be expected. Dentists realize the value of teeth and are inclined to take risks which are not justified where they allow such teeth to remain in the jaw as irritants.

In opening into the antrum by all means use a drill, or trephine and bur, in preference to the chisel, as the chisel splinters the bone and injures it far more than the rotary instruments.

For packing gauze in the antrum use a small fork-shaped instrument, which may be easily bent to adapt it to such a curve that all parts of the cavity may be reached by it. This instrument was suggested to me by Dr. McGinnis, one of the assistants at my clinic, and it works admirably.

If dentists were fully qualified to make critical examination of the nasal fossæ their usefulness would be greatly extended, and I hope and believe that in the near future we may have in the dental schools greater facilities for teaching the technique of nose examination by a well qualified rhinologist. So far as I am informed no dental school has systematic training in this work, and until it is a part of the curriculum the dentist will be handicapped and must at times call to his assistance the skilled rhinologist to aid in arriving at a positive diagnosis.—*Review.*

REFLECTIONS ON THE ABUSES OF "HOT AIR." By Garrett Newkirk, D.D.S., Pasadena, Cal. The relation of the following story to our subject may not be at first apparent, but I trust will be as we proceed. It is said that our late minister to England, Mr. Choate, and Chauncey Depew, who are good friends, never miss a chance to "roast" each other, and the latter tells this good one on himself. There is a town in New York state called Depew. Some people there discovered a well of natural gas, and thereupon proceeded to form a joint stock association called "The Depew Natural Gas Company, Limited." Mr. Choate, in the course of a speech at which Depew was present, drew from his pocket a copy of the prospectus. After looking the audience over and slowly reading off the title, he remarked with quiet and solemn emphasis, "Why limited?"

Some years ago, ten to fifteen perhaps, much was said and written on the use of hot air in the treatment of tooth cavities and root-canals. It was advocated by one or another as a remedy for about all the ills pertaining thereto, a sure pain obtunder, and preventive of future trouble. But ere long Dr. Black sounded the alarm that by the free use of hot air there was danger of checking and destroying the integrity of the tooth structure. We then discovered that while we supposed we were laying a sure foundation, we were really making flaws and weakening our building.

However, it is not of hot air that is injected into the teeth, but rather of that which passes between those organs that I wish to speak. Nor do I refer to the effects of hot air on the gums in the interproximate spaces, but rather to its consequences after it escapes from the mouth, producing vibrations of the auditory membranes, and, further, to the effect of these vibrations on the sensorium of the hearer, and various psychological phenomena thereafter.

I am led to presume that when hot air was a fad some time ago certain dentists acquired the habit of its employment, not alone in and upon the teeth, but for external application and to their professional brethren especially. The form of this "hot-air" application is peculiar and variable. Sometimes it seems aerial, and is blown or blowing; often gaseous and disagreeable; or liquid, which people are expected to "swallow;" or unctuous, to be "rubbed in," but whatever form it assumes it is in essense boastfulness or brag.

I am forced to conclude that dentists, or certain circles of them at least, are unusual experts in this line. Lawyers appear to reserve their hot-air blasts for the court or jury, seldom inflicting each other. Physicians occasionally have the morbid tendency, which, however, being contagious, they may have "caught" from our "walking" cases. Ministers and teachers, if they have the tendency, seldom exhibit it except in some mild or indirect form. For example I have heard of a bishop who in a convocation called in a solemn voice to the servant—"James, will you please to close the window behind *me*, and open another behind one of the inferior clergy."

Brag has many forms of expression and is not confined to those of whom we should expect nothing better. Some of our leading men are at times inflated with rarefied atmosphere to an astonishing degree, and strangely enough their boastfulness is not so often of what they know or what they can do, as it is of their marvelous money-making powers, in particular the amount of their daily, monthly or yearly income. It is to such that I wish to allude particularly. The first exponent that I remember of this aerial caloric was a distinguished member of the profession, who passed away many years ago, and is now I hope and trust far removed from the influence of all hot blasts. This gentleman seemed to measure every professional man simply and alone by the income standard. He would not say of one of his brethren that he was a man of excellent and skillful attainment, or that he served his patients with conscientious faithfulness and care; he never seemed to think of that, but only of his ability to get money. He would say of Dr. A, "Yes, I suppose he does some work with a certain class, but I'll venture he never made five thousand dollars in any year of his life;" of Dr. B, a really worthy but modest young man, "Oh, he's a mere poke, his income isn't over three thousand dollars." Again he would say in a grand way, "How many men in the city do you suppose are making twenty thousand dollars a year? How many fifteen thousand?" On your expressing your ignorance he would begin to enumerate: "Well, there's C, he may be doing fifteen thousand, but I'm inclined to think reports are exaggerated in his case. He may reach ten or twelve thousand; you know he has a man working for him." And so he would go on half way down the alphabet, "sizing up" the brethren,

and all on the basis of their supposed income. I could never understand that he was actually in possession of facts on which to base his estimates; but the chief aim of his discourse was to impress on you that he at least was doing a business of twenty thousand a year, and that in all probability there was not another.

I fear that on the departure of this man from the sphere of dollars and cents his mantle fell or was blown upon more than one Elisha of this school of prophets. I have heard since, or had reports from others, of numerous conversations held in atmospheric currents of high temperature. I was told of a dinner (no names were given me) where in a certain city a party of dentists were being entertained. When cigars were lighted the conversation turned at once to the matter of professional income, especially of their incomes, in which boastfulness was the moving spirit. Among them, however, was a gentleman from the South, who, my informant said, stands among the very elect of that region. After listening for some time to the large if not extravagant claims made by others, he said with his delicious Southern accent—"Well, gentlemen, I am quite surprised, indeed, at what you all tell me. I can't neah come up to you fellows in the way of fees; don't believe I eveh got moh'n ten dollars foh a filling in my life, an' I don't believe I eveh had a yeah's business that amounted to three thousand five hundred dollars." From the looks cast on him, my informant says, one might have inferred that he had made a most humiliating confession. I said no names were given, but it seems that his was "Dennis" on that occasion. Next day the Southerner saw a picture in the office of my informant which he admired very much. After he had gone home the owner bought a duplicate, which he had neatly framed and forwarded, with a note to the effect that the gift was to express his admiration of the man who had such a combination of courage and modesty.

If those who indulge in such boasting of fees and income, whether they tell the truth or not, would give the matter a little serious thought they would surely discover their habit to be a very injurious one. First, it cultivates egotism of an offensive sort in the man himself. It makes him self-inflated, the very opposite of what he should be. Second, it makes him vain—i. e., anxious to be thought greater and more successful than he probably is. It is an exhibition of a weakness, which it also cultivates. It is in

essence a form of selfishness which will not stand for a moment before any ethical test. No man can boast without belittling others, at least by inference. Third, while a man may boast or brag and tell only the truth about his work or income, this is not, I think, usual. As a rule there is much of coloring and there comes with the habit a great temptation to downright lying. Fourth, it has deleterious effects in various ways upon others, especially those who are younger. The more prominent the boaster may be, the more he is looked up to, the greater will be the injury from his bad example. I have known some young men to have their manners, if not their morals, sadly marred in this way.

Fifth, boastfulness—extravagant speech tends to the promotion of extravagant habits, and in some instances the extravagance grows to recklessness. I knew of an extravagant boaster who spent his summers with his family at the most fashionable resorts regardless of expense, usually borrowing money therefor. After his death his family were almost in a state of absolute want, and the last I knew of them his oldest daughter was struggling with the management of a cheap boarding-house. The boaster is quite sure to imagine that, in order to make his words good, he must be free with his money in the way of expensive entertainment, membership of clubs, etc., and others seem to expect all this as a matter of course. It is true that the boaster is not always lavish of money, nor is the spendthrift always a boaster, but as a rule the two forms of extravagance go together.

Sixth, the habit of talking very much about one's income either in a boastful or deprecatory way is not in good taste. What a man is, in his personal and professional character—what he can do—the honesty and thoroughness of his work, these are important. What money he makes, so he is able to keep his family respectably and pay his debts, this is not the business of his neighbors. If A makes it a point to tell B the amount of his daily or yearly income one or two consequences is likely to follow. If the amount named is greater than B knows himself to be receiving, he thinks he is being "put upon," and if the sum is excessive he thinks A is lying. If the amount given is below that of his own, a rare occurrence, he will have a feeling of more or less contempt for A. In either case the respect of B for A is not increased but

diminished. A has no more respect for himself, so nothing is gained by either.

Seventh, boasting of income—magnifying the pecuniary at the expense of the ethical—sets up a false standard of values. The boaster cultivates in himself an obliquity of vision, spoils his own perspective, and, so far as he has imitation, does others the same injury. If musical art is only one form of an expression of the truth, surely the boaster maketh discord with the harmony of speech.—*Brief.*

RELATION OF HYPEREMIA TO DENTAL DISEASES. By Dr. E. L. Patchin, Cleveland. Read before the Cleveland Dental Society. I shall have to bore you with a dim outline of anatomy, just enough for my point on hyperemia or arterial lesions to show the relation and effect upon the peridental membrane. The human brain has more circulation than any other vital organ of its size, and on account of its irregular surface or convolutions is capable of being packed into smaller compass with less restriction to its circulation. The circulation of the brain is so well devised that the large vessels enter at the basis crani, two at the anterior, two at the posterior, and unite in a middle region to form the circle of Willis, where the blood-currents unite and the heart contractions are to an extent modified and equalized. From this circle the distributions are made to the hemispheres of the brain. There is an absence of communication between the arteries, so if there should be a thrombus or embolus in one it would not directly affect the others; particularly is this true of the cortex or brain mantle, which is very important, as it is the seat of mind and reason.

According to Berkley, Tuke and perhaps others, the abnormal loss of brain or nerve cells (as they are of nervous origin) affects the mental and physical well-being in proportion to the amount of degeneration of nerve cells.

The arterial blood furnishes the nutrition to the arteries and nerves connected by papillæ; if abnormally copious it is active, if thick and clotted it is passive, hyperemia.

Hyperemia mixed with irritating matter is supposed to cause arteritis and is brought about by influences both in and out of the artery; this is commonly called blood-clot and may result in thick-

ening the walls of the vessels as in hypertrophy. Talbot in a late paper says: "It is the result of endarteritis or inflamed internal coat of the arteries and capillaries."

The arteries consist of an endothelium or layer of flattened cells. These are in contact with the blood-currents; next is the tunica intima, elastic fibers laid longitudinally; next comes the middle coat arranged transversely. The outer coat consists of longitudinal connective tissue, which contains the vasa vasorum. The walls of the capillaries consist of almost nothing but the intima or inner coat; these contract or dilate without muscular fibers. The veins also have a certain contraction and dilation from irritation of the intima. Each coat of the arteries takes a special type of inflammation, and it occurs to me that if such is the case we must look for a different blood-supply for each of these coats. (If this be true it is a revelation in seamless tube-making.)

Inflammation of the intima of the blood vessels may be due to irritation from within or without. When it occurs from without, as in interdental blood-vessels, any irritation will cause the arterioles or gates of the arteries to open, and transfusion of blood, etc., is thrown into the capillaries, sometimes to their destruction, and we observe it in scurvy of the gums; or when calomel is used, in the streaked appearance denoting its presence in the circulation. Particularly is this true when medicaments are given and an irritation from within is set up by hyperemia or gingivitis. Many drugs have this effect upon the capillaries, whether used locally or constitutionally. The action of alcohol in chronic alcoholism causes transfusion of blood from the arterioles into the capillaries. Destruction of the capillaries is not mentioned, but destruction of patient is.

A systemic disturbance of the blood may cause pyorrhea alveolaris, together with a local irritation, or may form an abscess through infiltration. We may have to destroy a pulp, or it may die as the result of strangulation. If left to putrefy we have an abscess by infiltration of the putrescence and hyperemia galore from the irritation. Hyperemia and its results on the surface of the gums may cause a deep-seated abscess of the process, or the bones of the jaws by infiltration and resorption.

Talbot says, in substance, what concerns the dentist most in arteritis diseases of the gums, etc., "Is the fact that the adveolar

process is a transitory structure and is hence subject to atrophy and disease." This is due to the fact that the structure is an end organ, the nerves and blood-vessels approach a blank wall. The root of the tooth is virtually a foreign substance. The blood-vessels and nerves concerned are approximately end organs and are affected by both local and constitutional causes.

Neuralgia is the cry of the nerves for more nutriment through medullary influence of good blood-supply. Lesions caused by accident to the arteries or nerves are common, the nerves of course being the complainants, and the neuralgic pain is confined to one side at a time.

We have a class of patients, who belong to the practicing M. D. or specialist on nervous diseases, and should not have been called into this paper except to show the effect of dental diseases. These patients come to us sometimes from their family physician, and should have our most kindly attention. We have a chance to note their condition, and often they volunteer information in regard to their cases. We become anxious for their recovery, and bring out our books and use up some brain-cells for the good of theory. They complain of a pain at the base of the brain. Generally at first it is very severe, and is often given the name of neuralgia by the patient. Perhaps we find trouble in the teeth; at least we have stopped one irritation in our professional duty.

Hyperemia at the base of the brain, or reflected there, has been complained of by brain-workers, or those under prolonged mental strain, and is easily confounded with neurasthenia. As the blood furnishes nutriment to the nerves they draw upon this source. It is given in chronic cases as passive hyperemia. Among those under my care complaining of it are a judge, who has insomnia and has had it for years, teachers, preachers and business men, generally those who have many cares and are of a sedentary occupation. Syphilitic consumptives and people subject to senile decay might come under this head.

Sometimes people do not know that there is any trouble. The clot becomes organized and forms a thrombus and perhaps paralysis is the result. This could become disorganized and thrown into smaller arteries, affecting the motor or fifth nerves, thus depriving them of a part or of all of their functions, as in embolism.

Patients who are paralytics are not hard to diagnose as such.

I have had several of a hypersensitive kind, where the shock was slight. They complained of the head-rest striking a sore spot at the base of the brain, or when the shock was on the right side I have had two cases where they complained of a sore spot about where my left arm rests over the head, perhaps due to the nerves crossing at or near the base of the brain, and manifesting its location at that part of the brain. Surely this crossing is a wise provision of nature.

A case over which I have worked for about fifteen years has excited my interest. Dr. B., a retired physician, had a slight shock on the right side from senile decay (so he thought), and after it his teeth on that side (all having live pulps) began to trouble him. I extracted three, after trying in vain to get treatment to the pulps. These were sound teeth, but he begged me to remove them, and I did so at intervals of several hours. The next offender was a lower. I put pressure anesthesia on the pulp and removed it, then cared for the tooth to the best of my ability. The upper teeth are beginning, three are involved, in which I am killing the pulps at present; the pain has subsided, but the hypersensitive condition of the nerves is very marked. He complains of a very sensitive state of the lips, palm of the hand, and center of the foot, when touched. He and I have called this case hypersensitivity of the nerves of sensation, while the motor nerves are affected, due to senile lesion. I am told it is a rare case.

I have had some trouble with paralytic patients wearing dentures, the immobility of the tongue being one drawback in keeping an upper plate in place.

I am indebted to Dr. H. B. Butler, dentist of the New York State Asylum, who has great opportunities to study hyperemia in brain ills and their effect upon the peridental membrane. His letter is as follows:

"Ogdensburg, N. Y.

"My Dear Doctor:

"In reply to yours of the 12th, would say that facial neuralgia is seldom observed among the insane. There are so many different types that I cannot answer in detail. Generally speaking, however, I find almost a total indifference among the patients. A tooth that would give all kinds of trouble in private practice appears to be passive at the hospital.

"Think you can safely say that any hyperemia in brain ills would result in loss of sensation in dental tissue in proportion to the degree of degeneration of brain cells.

"Even in our most violently disturbed patients, those having delusions, I find almost no appreciation of the pain accompanying extraction. Sometimes it is very difficult to induce them to sit in the chair, but afterward examination or extraction produce about the same resistance. I have several patients who have come frequently desiring extraction of sound teeth, the sensation being one they seem to desire.

"Of course there are exceptions to the rule. I think those insane as result of some injury to the skull are more sensitive to pain along the dental nerve than the normal person.

"Extreme cases of alveolar abscess are common of course, but in many instances pass unnoticed by patients.

"Red stain, said by Kirk to be characteristic, is met with very rarely and is found oftener in private practice.

"Hoping this may be of some service, I am, truly yours,

"H. B. Butler."

I have made some inquiry in regard to our asylum at Newburgh, and find that they have very little work for a dentist. The report, however, is very nearly the same. The New York asylum is much larger.—*Summary.*

DISPROPORTION IN THE DIMENSIONAL RELATIONS OF THE TEETH AND JAWS: A STUDY IN COMPARATIVE ANATOMY. By Wm. Bebb, D. D. S., Los Angeles, Cal. In the November *Cosmos* Dr. Norman G. Reoch, in an article entitled "The Fundamental Principles of Orthodontia," makes this statement: "It seems to me it is time that old fossilized theory of small jaws and large teeth be exploded." This expression, or one cast in the same mold, appears so frequently in the writings of authors belonging to the "new school of orthodontia" as to lead one to infer that it is one of the established articles of their creed. If by the expression they mean only to censure that class of general practitioners who, for lack of better education, use the term to justify extraction for correction of malocclusion of the teeth, where such procedure is decidedly contra-indicated, and irreparable injury is done to the patient thereby, then I say amen,

for I, too, believe it is high time that that class of operators be shown the folly of their teachings and the error of their ways; but if the assertion is made to be accepted literally, as embodying a scientific fact, that there exists no such thing as large jaws and small teeth, and large teeth and small jaws, then I take exception.

In this age and day few people doubt the essential truth of the theory of evolution, the doctrine of "natural selection," or the principles laid down by Darwin in his chapter on "Variation Under Domestication." If we do accept these theories, if we believe that evolution is founded upon variation, and that the greatest variations occur in plants and animals under domestication, then we must admit that there frequently occurs in the arrangement of human teeth, in proportion to the supporting tissue, slight variations, and if there exist variations in a slight degree, why not in a greater one, and why may we not have large teeth and small jaws?

Variations occur in much greater degree than is generally supposed, "often reaching 20 per cent of the part implicated, and this without reference to the general size of the animal. (Wallace on Darwinism.)

Some time ago I undertook the measurement of jaws of human crania in order to arrive if possible at some definite basis by which one could determine the relative amount of tooth-substance as compared to the size of the maxillæ, but the hopelessness of the task soon influenced me to abandon it. However, the few cases I examined revealed an amount of tooth-substance, obtained by measuring each individual tooth between contact points and adding these results, from the central incisors to the third molars, of from 60 to 70 mm.; while single bicuspids varied from 5 to 8 mm., and molars from 9 to 13 mm. A bicuspid 8 mm. in diameter, as compared with the smallest amount of tooth-substance in a single maxilla of 60.5 mm., is 13.2 per cent. A molar 13 mm. in the same arch is 21.3 per cent.

Now, suppose we had "a variation of 20 per cent in the part implicated, without reference to the size of the animal," or a mandible and teeth 20 per cent larger than the general size of the cranium, would it not be possible, and indicated for the correction thereof, to extract therefrom a bicuspid 8 mm. in diameter, or 13.2 per cent of the whole (an unusually large percentage), and still

have 6.8 per cent of space left over? Or a molar 12 mm. wide, and then have a variance of only 1.03 per cent the other way?

If we could produce for comparison a type specimen of a skull from which man has descended, it would be impossible to find among living subjects a single specimen involving the teeth, not in malocclusion but comparative size of the teeth and mandibles, in which there was not a deviation from the normal, and which no amount of mechanical procedure could restore to the normal. At the same time I believe there exists but a small percentage of cases where the variation is so great as to warrant the extraction of a bicuspid fully 7 mm. in width between contact points, or a molar 11 or 12 mm., to correct the same.

I will now show some illustrations presenting conditions which, while they are by no means conclusive, are an argument in favor of the existence of small jaws and large teeth.

I have measured the mandibles of many wild and domestic Canidæ, taking as my base a line drawn from the distal margin of the alveoli of the central incisors to an intersecting line drawn from the distal surfaces of the last molars. These, with the total tooth-substance as represented by the premolars and molars, measured in their greatest diameter, are the measurements upon which the arguments advanced in this article are based.

In making selections for these illustrations I have avoided those specimens which were in any way extreme, except the first one, which is from the skull of a gray wolf (*Canis occidentalis*), and the largest specimen from my collection of nineteen wild Canidæ. The others are all average specimens.

I ask the reader to grant that the bull terrier, bulldog, and mastiff descended from the gray wolf. This concession may be reluctantly made, because the probability that they did so is remote. While some of our domestic animals have been traced to one wild ancestor, we are reasonably sure that the domestic dog had several. Native tribes, with their fondness for taming wild animals, domesticated the wild Canidæ found in the country over which they roamed, and the ancestry of our domestic dogs of to-day can undoubtedly be traced to several of these progenitors.

However, there being no counterpart of the bulldog found among the prehistoric or early specimens of the Canidæ, it is highly probable that they are the result of selection by man, and I have

no doubt that the wild ancestor of the domestic animals I offer was a less powerful animal than the one which I give for comparison. In fact, the bulldog from which the skull illustrated was taken was an animal slightly greater in proportions than that from which the second illustration was made—a specimen of the California coyote (*Canis ochropus*). One which I trapped myself has a mandible measurement of 97 mm., with a tooth-substance of 69.5 mm. I believe it would be more just to compare the domestic dogs with this latter specimen, but for the sake of argument I have selected, as I said before, the very largest wild Canidæ in my collection.

The illustration of the gray wolf shows a large and powerful animal. The zygoma is thick, broad, and heavy, and the ridges are prominent for the attachment and support of the powerful muscles with which this animal is endowed. The jaws are long and in every way well formed, the teeth are well proportioned and symmetrically arranged—a typical dentition and articulation as represented by the wild Canidæ. Applying the above method of measurement to this specimen, we find it has a mandible of 103 mm., with a total pre-molar and molar tooth-substance of 80 mm.

The third illustration is of a bull terrier, and here may be observed the result of domestication. The frontal bone becomes more prominent, and the maxilla shortened until there is a slight protrusion of the lower anterior teeth. Both arches, upper and lower, are expanded, with the teeth somewhat irregular in arrangement. The mandible measurement in this specimen is 85 mm., a shortening from the wolf of 18 mm., while the total tooth-substance is 69 mm., a lessened amount of but 11 mm.

Observing the fourth illustration, of a well-bred bulldog, a wide divergence from the characteristics of the wolf is noticed, all due to "variations under domestication." The bones of the crania and face are both altered, the maxilla has been so shortened as to give a decided protrusion to the lower anterior teeth, and the upper cuspid has been carried backward until it fails to come in contact with the opposing one, and thus has become more or less functionless. The maxilla is expanded and the teeth forced out of alignment and occlusion, while the mandible is forced to an abnormal curvature, both from a lateral and vertical plane. This crowded condition of the teeth can, I believe, be accounted for

by the theory that bone is more subject to influence than the teeth, and that while the maxillary bones, by reason of their lack of density as compared with the teeth, have become much shortened, the teeth, being dense, non-elastic, and non-yielding, remain little changed.

In this specimen we have a mandible measurement of 72 mm., containing 68.5 mm. of tooth-substance, a diminution from the gray wolf of the great amount in mandible measurement of 31 mm., while in tooth-substance there is a difference of only 11.5 mm. Compared with the coyote, the bulldog has 25 mm. less mandible and only 1 mm. less tooth-substance.

Again, in the skull of a mastiff we have a larger and more powerful animal than the wolf, and the skull in every way is of greater proportions except the teeth. The mandible measurement is 116.5 mm., an increase of 13.5 mm. above the wolf, while the tooth-substance remains exactly the same, or 80 mm.

If I interpret the orthodontists correctly, they would say the teeth of the bulldog are in perfect harmony with the supporting integument, only you must establish "normal occlusion" by mechanical procedure, protrude the jaws and contract the arches until the teeth occupy their normal position, such as the conditions were before man interfered. The result would be what? A dog with body, limbs, crania all in good proportion, and with a long, narrow snout, like a wolf or coyote. Shorten the mastiff's arches until this noble animal resembles an overgrown pug dog, and would you not arrive at the conditions which the orthodontists seek in the human?

Table of Measurements, in millimeters.

	Length of mandible.	Amount of tooth structure.
Gray wolf	103	80
Bulldog	72	68.5
Coyote	97	69.5
Bull terrier	85	69
Mastiff	116.5	80

—*Cosmos.*

TEETH AND TUBERCULOSIS: TUBERCULOUS PERIODONTITIS. (Prof. Partsch in *Deutsche Med. Woch.*) The enamel of teeth is a special modification of the buccal epithelium. Owing to the frequency of dental caries and the prevalence of bacteria in the mouth it is surprising that dental infection is not more frequent. Probably in dental caries the number of species of bacteria which multiply in the softened dentin have an inhibitory action on the growth of certain organisms, such as the tubercle bacillus. It has been repeatedly shown that even if the sputum contains quantities of tubercle bacilli none is discoverable in stained specimens taken from carious cavities in teeth unless a purulent mass has lodged in them. A further protection against infection with tubercle bacilli is the fact that if they penetrate to the dental pulp the latter is devoid of lymphatics. If the pulp is lost through gangrene the exposed pulp-cavity with the dentinal tubules is shut off from the rest of the body by the granulations which form at the apex of the fang owing to the absence of the protective epithelium. These conditions render infection through the teeth rare, but if the organism is weakened by prolonged tuberculosis infection may occur. According to Zandy, of thirty-seven cases of alveolar tuberculosis infection probably occurred by direct continuity in three cases of lupus. In the majority of the remainder tuberculosis either primarily, or more often secondarily, affected the buccal mucosa, including that of the alveoli, and attacked the gums and teeth later.

If the gums are destroyed the alveoli are exposed; necrosis may result, and the teeth become loose and fall out. In five of the thirty-seven cases tuberculous ulceration, which was frequently accompanied by exfoliation of bone, occurred after extraction of teeth or roots at the site of the wound. Even in these cases it was doubtful whether the teeth played any direct part in the process of infection. Zandy regards caries of the alveolar process as not infrequently due to the penetration of tubercle bacilli, either between the teeth and the gums, or through a carious dental cavity and the pulp. Starck has claimed that tuberculous cervical glands may arise through dental infection. Before such a connection is conceded it must be shown (1) that the glands primarily affected receive the lymphatics from the neighborhood of the affected tooth, and (2) that the pulp has been destroyed. In the following case the connection between the teeth and tuberculous cervical glands appeared conclusive:

A previously healthy girl, aged 14½, in November, 1903, had pain in a carious left lower first molar. A dental surgeon found the tooth to be loose, with a large cavity on the inner side, and the tooth was tender on percussion. The soft parts over the horizontal ramus of the left lower jaw were swollen, and there were a submaxillary gland the size of a cherry and enlargement of the lower jaw. As the crown was strong the pulp-cavity was opened up, and repeated attempts were made to disinfect it, with a view to saving the tooth. On January 15 the tooth was painful and tender and had become looser, and on pressure pus welled up on its outer side. The submaxillary was larger, so the tooth was extracted. Neither the tooth nor the alveolus was fractured, but contrary to expectation, the periostitis and lymphadenitis not only persisted but were aggravated. On January 28 a second tender, enlarged gland was noticed behind the first, under the angle of the jaw, and there was great swelling of the face. The lower edge of the horizontal ramus of the jaw was thickened. The extraction wound had not healed on March 8, and though its surface secreted no pus, the edges were reddened and swollen. Several small fragments of bone were removed through the wound. She consulted the writer on March 11. The interalveolar septum between the first and second left lower molars was absent and the latter tooth was loosened. The submaxillary glands and one of the anterior superior cervical glands were enlarged. In spite of oral asepsis and hot applications to the glands there was no improvement. There were occasional evening rises of temperature, not exceeding 100.6° F. On March 22 the submaxillary region was exposed, and three submaxillary and one submental gland were excised. One of the glands was caseous, and the others contained miliary tubercles. An enlarged gland at the upper end of the anterior border of the sterno-mastoid was excised through a separate incision, which was immediately closed. The anterior wound was plugged. An incision was then made directly over the bone and the periosteum was peeled off. Near the upper angle of the wound in the neighborhood of the first lower molar was a carious spot, leading to a cavity the size of a walnut, filled with granulations and small sequestra. This was scraped with a sharp spoon. After extraction of the first and second molars the cavity in the jaw was found to communicate with the mouth. The ragged edges of the gums were excised; the cavity was plugged

with gauze, both from the mouth and from without, and the skin was closed. Some pus afterward accumulated behind the upper wound. The cervical wound healed by first intention. The cavity in the bone granulated, and on July 13 had firmly closed externally. Some thickening and redness of the gums remained. Through the internal wound a few splinters of bone had escaped and bare bone could be felt. The general health was satisfactory and weight had been gained.

As there was no sign of tuberculosis elsewhere it is probable that the jaw and submaxillary glands were primarily infected. Microscopic examination of the removed fragments confirmed the diagnosis of tubercle. In sections of the second lower molar it could be seen that the tuberculous process had first attacked the periodontium. The epithelium of the gums was intact, but the submucous tissue was infiltrated with leucocytes. Thus the primary lesion was a tuberculous periodontitis. The bacilli had gained access through the carious first lower molar.

MENORRHAGIA FOLLOWING THE EXTRACTION OF TEETH.—A. Anoufrieff (*Roussky Vratch*) reports a rather unusual case of menorrhagia in a married woman, aged 25, unipara, who was seized with extremely violent bleeding from the uterus soon after the extraction of some dental roots under chloroform anesthesia. She was brought to the hospital in a state of acute anemia. A great variety of remedies was given, including ergot, strychnin, etc., internally, and tampons saturated with various solutions as packing. Finally the uterus was curetted, a hot douche given, and a strip of gauze saturated in adrenalin solution was inserted into the uterus. Even this did not act immediately, but finally arrested the hemorrhage for twenty-four hours, when the treatment had to be renewed so far as the packing was concerned. The scrapings showed the presence of chronic follicular endometritis. The author calls attention to this case as illustrating the connection of menstruation with the teeth, a subject not mentioned in the text book, although the connection of pregnancy with the teeth is well known. From a collection of cases of abnormalities of menstruation gleaned from literature, Anoufrieff found that during the periods there may be neuralgia, swelling of the gums, bleeding from the gums, and sensitiveness of the dentin. Dentists are aware of the fact that hemorrhages may occur after the extraction of teeth when the operation is performed shortly before or during menstruation, while the same women undergo extractions without any evil consequences between menstrual periods. The author therefore urges that dentists should not extract teeth during menstruation, and should even refrain from filling with gold, or doing any other painful or exhausting work on the teeth during the periods.

The Dental Digest.

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At 2231 Prairie Avenue, Chicago,

Where All Communications Should be Addressed.

Editorial.

THE DENTAL STUDENT AND HIS VACATIONS.

The article by Dr. Wm. H. Potter in this issue will undoubtedly call forth considerable discussion, especially from college men, as it not only brings forward some novel ideas with regard to the summer vacation, but also touches upon the subject of the three-year or four-year course. When this latter question was so earnestly and widely discussed some months ago we refrained from expressing any opinion on it—first, because it seemed a matter for the schools and their faculties to decide, and second, because there was so much bitterness and feeling displayed in the discussion by the two factions. Now, however, we must state our views in order to comment intelligently upon Dr. Potter's paper, and we are forced to say that we do not see any advantage in stretching through four years practically the same number of teaching months as are given in three. We do, however, see some serious disadvantages, most important of which is that the student would be obliged under the four years' course to practically waste a year.

We quite agree with Dr. Potter that dental students do not need such long summer vacations. When the discussion was at its height some of the exponents of the four-year term argued strenuously that the brains of dental students could not stand the strain of so long teaching periods, and must be given considerable respites between terms in order to recover from the same. Any students to whom this argument would truthfully apply should at once give up the study of dentistry, for if their brains are so delicate or so immature and undeveloped as the aforesaid gentlemen would have us believe, they will make dismal failures in the actual practice of dentistry, in comparison with which the average

dental college course is a sinecure. Furthermore, any dental student who cannot stand at least eight or nine months of actual teaching in the year should not be admitted to any school, as it is conclusive evidence that his previous mental training has been sadly deficient. Dental students as a rule have attained their physical growth, so have the full use of their mental faculties. Public-school children, high-school pupils, and those in preparatory schools, whose mentality is handicapped by the demands of their growing bodies, as a rule are given nearly nine actual months of instruction. No one will argue that the course in the average college, university and scientific school is not much harder or does not involve a far greater mental strain upon the students of those institutions than the course in the average dental school, yet in practically all those institutions three months or less of actual vacation are given. The average young man in commercial life, especially those who are ambitious, as all dental students should be, uses his brain quite as actively as the latter, works as a rule eight or ten hours a day for six days in the week, and manages to escape a nervous or physical breakdown with usually no more than two weeks' vacation each year. We might go on enumerating such cases and making comparisons indefinitely, but we believe enough has been said to prove to the unprejudiced reader that the contention that dental students are mentally or physically overworked is not well founded.

To go still further, we believe that Dr. Potter's suggestion of practical work during the summer vacation is an excellent one. At this age the mind of the student is in a formative condition, and the influence upon both mind and character will be far better if at least a part of the summer vacation is spent with benefit and profit to himself, instead of dawdling away the whole time or using it for illegal practice in his home town. Furthermore, the practice of dentistry being largely mechanical, the student thus has an opportunity to perfect his manipulative ability, and stands less chance of losing through the long vacation the skill that he may have acquired in this line. Finally, a month or six weeks' vacation will afford him all the rest necessary, and he will return to school in much better mental and even physical condition for work than after a longer period.

It will of course be argued that for the dental schools to estab-

lish these summer courses means a considerable additional expense. Considering the greater benefit which will accrue to the students, the tuition fees should certainly be increased, and even with the present course there is every reason for raising same, as they are at present by no means adequate for the work in hand and are not commensurate with the value received by the student. Higher fees would mean better equipment, and more important, better-paid instructors.

Notices.

GRANT COUNTY (IND.) DENTAL ASSOCIATION.

The Grant County Dental Association was organized Oct. 5, 1905, and the following officers were elected: President, E. McLain; Secretary, N. W. Hiatt; Treasurer, Forrest Freeman, Gas City.

CEDAR RAPIDS (IA.) DENTAL SOCIETY.

The Cedar Rapids Dental Society held its annual meeting Oct. 14, 1905, and elected these officers for the ensuing year: President, F. E. Miller; Vice-president, B. H. McKeeby; Secretary, C. B. Whelpley; Treasurer, J. B. Hepler (reelected).

MERCER COUNTY (N. J.) DENTAL SOCIETY.

The Mercer County Dental Society held its annual meeting and banquet at Trenton, Oct. 12, 1905, and elected the following officers: President, A. E. Boice; Vice-president, E. H. Ginnelly; Secretary, John C. Forsythe; Treasurer, E. C. Condict.

OHIO STATE DENTAL SOCIETY.

The fortieth annual meeting of the Ohio State Dental Society will be held in the Great Southern Hotel, Columbus, Dec. 5-7, 1905. An exceptionally strong program of papers and clinics has been provided and we have every assurance of a highly successful meeting. Come!

F. R. CHAPMAN, Sec'y, 305 Schultz Bldg., Columbus.

INDIANA STATE BOARD OF DENTAL EXAMINERS.

The Indiana State Board of Dental Examiners will hold their next regular meeting at Ft. Wayne, Jan. 9-11, 1906, in the office of Dr. J. S. McCurdy. All applications for examination must be filed with the Secretary not later than Jan. 4. For further information apply to the Secretary,

F. R. HENSHAW, Middletown.

CENTRAL TEXAS DENTAL SOCIETY.

The quarterly meeting of the Central Texas Dental Society was held at Belton, Oct. 21, 1905, and the following officers were elected: President, J. K. Campbell, Temple; Vice-president, W. B. Foreman, Waco; Secretary, J. M. Murphy, Temple; Member Executive Committee, W. H. Guess, Rogers.

NEW LONDON COUNTY (CONN.) DENTAL SOCIETY.

The annual meeting of the New London County Dental Society was held Oct. 2, 1905, and the following officers were elected: President, A. W. Crosby; Vice-president, Edward Prentis; Secretary, Ralph H. Keeler; Treasurer, G. N. Bates; Executive Committee, W. S. Smith, Arthur V. Prentis and E. P. Fitch.

INLAY CLUB OF THE IOWA STATE DENTAL SOCIETY.

The Inlay Club of the Iowa State Dental Society was organized at Ottumwa, Oct. 16, 1905, and the following officers were elected for the ensuing year: President, J. B. Monfort, Fairfield; Vice-president, C. E. Woodbury, Council Bluffs; Secretary and Treasurer, G. W. Slingluff, Burlington.

ERIE (PA.) DENTAL SOCIETY.

At the annual meeting of the Erie Dental Society, held Oct. 21, 1905, the following officers were elected: President, G. J. Mead; Vice-president, G. W. Cochran; Secretary, James H. Kelsey; Treasurer, C. C. Pollitt; Executive Committee, Chairman, J. M. Horner, H. B. Randall, W. G. Wilson, N. C. Campbell and J. S. Smith.

KANSAS CITY (MO.) DENTAL SOCIETY.

The Kansas City Dental Society was formed Oct. 20, 1905, and the following officers were elected: President, J. P. Root; Vice-president, K. P. Ashley; Secretary and Treasurer, T. E. Purcell; Corresponding Secretary, F. G. Worthley; Executive Committee, C. L. Hungerford, J. D. Patterson and H. S. Vaughn. Regular meetings will be held the second Tuesday of each month.

NORTHEASTERN DENTAL ASSOCIATION.

At the annual meeting of the Northeastern Dental Association, held in Rutland, Vt., Oct. 11, 1905, the following officers were elected: President, T. J. Barrett, Worcester, Mass.; 1st Vice-president, Jas. E. Power, Providence, R. I.; 2d Vice-president, E. B. Griffith, Bridgeport, Conn.; Secretary, E. O. Kinsman, Cambridge, Mass.; Assistant Secretary, Chas. H. Riggs, Hartford, Conn.; Treasurer, Chas. F. Prebble, Forest Mills, Mass.; Librarian, F. T. Murlless, Jr., Windsor Locks, Conn.; Editor, David Manning, Burlington, Vt.

HARTFORD (CONN.) DENTAL SOCIETY.

The Hartford (Conn.) Dental Society held its seventh annual meeting Oct. 9, 1905, and the following officers were elected; President, A. E. Carey; Vice-president, E. R. Whitford; Secretary, E. H. Munger; Treasurer, A. A. Hunt; Librarian, J. H. Kane; Executive Committee-Chairman, H. E. Snow, Charles H. Riggs, M. J. Goodwin.

SOUTHWESTERN IOWA DENTAL ASSOCIATION.

At the annual meeting of the Southwestern Iowa Dental Association, held in Creston, Oct. 13, 1905, the following officers were elected: President, T. M. Kelsey, Villisca; Vice-president, F. H. Scranton, Corning; Secretary, George Brooks, Greenfield; Treasurer, G. E. King, Villisca. The next meeting will be held at Red Oak on the second Tuesday in October, 1906.

IOWA STATE BOARD OF DENTAL EXAMINERS.

The Iowa State Board of Dental Examiners announce that they will meet at the Capitol Building, Des Moines, at 9 a. m., Dec. 12-13, 1905, to examine applicants for license to practice dentistry and for the transaction of any other business that may come before them. For application blanks and all information, apply to E. D. BROWER, Sec'y, Le Mars.

NORTHERN ILLINOIS DENTAL SOCIETY.

The annual meeting of the Northern Illinois Dental Society was held at Elgin, Oct. 20, 1905, and the following officers were elected: President, F. E. Cheeseman, Chicago; Vice-president, C. L. Snyder, Freeport; Secretary, A. M. Harrison, Rockford; Treasurer, W. H. G. Logan, Chicago. The next meeting will be held in Aurora.

MONTREAL DENTAL CLUB.

The Montreal (Can.) Dental Club held its annual meeting Oct. 24, 1905, and elected the following officers: President, J. H. Springle; Vice-president, W. W. Watson; Secretary, Stanley Burns; Committee of Management, Peter Brown, De Pennier, J. B. Morrison and G. W. Oliver. The club will have a dinner and session the second Tuesday in every month throughout the ensuing season.

SOUTHERN ILLINOIS DENTAL ASSOCIATION.

The twentieth annual meeting of the Southern Illinois Dental Association was held at Litchfield, Oct. 24, 1905, and the following officers were elected: President, C. E. Uyningham, Harrisburg; Vice-president, W. S. Wallace, Sparta; Secretary, H. H. Barnett, Upper Alton; Treasurer, A. F. Strange, Litchfield; Executive Committee, J. H. Hood, Sparta; F. C. Reader, E. St. Louis; T. T. Baker, Litchfield. The association will meet at Centralia in October, 1906.

INSTITUTE OF DENTAL PEDAGOGICS.

The annual meeting of the Institute of Dental Pedagogics will be held in the Fifth Avenue Hotel, New York City, Dec. 28-30, 1905. The following subjects will be discussed: Anesthesia, Extraction, Operative Technic, Prosthetic Technic, Crown and Bridge Technic, Orthodontia Technic, Porcelain Technic, Chemistry, Anatomy, Oral Surgery, and Teaching in the Infirmary. The main idea of the meeting will be "How should these subjects be presented to a dental student?" This will be the most important dental meeting of the year, especially for teachers. As far as possible every demonstrator, as well as the professors, should make an effort to be present.

W. E. WILLMOT, Sec'y, 93 College St., Toronto, Can.

ROCK ISLAND COUNTY (ILL.) DENTAL ASSOCIATION.

At the annual meeting of the Rock Island County Dental Association, held in Rock Island, Oct. 17, 1905, the following officers were elected: President, R. M. Pearce, Rock Island; 1st Vice-president, H. G. Trent, Rock Island; 2d Vice-president, M. M. Everett, Atkinson; 3d Vice-president, Owen C. Hays, Cable; Secretary, W. T. Lockhardt, Moline; Treasurer, C. L. Silvis, Rock Island; Board of Censors—L. W. Skidmore, Moline; A. H. McCandless, Rock Island; C. R. Baker, Davenport; Program Committee—Mary G. Robeson, Moline; Fred Graflund, Moline; W. H. Carl, Rock Island; Membership Committee—C. L. Silvis, Rock Island; G. L. David, Aledo; G. L. Wood, Geneseo; W. G. Hay, Moline.

News Summary.

T. D. STONE, a dentist of Ft. Worth, Tex., died Oct. 22, 1905.

E. L. BONE, a dentist of Dayton, O., died very suddenly Oct. 26, 1905.

M. L. WILLIAMSON, a dentist of Marietta, O., was drowned Oct. 22, 1905

H. S. YOUNG, a dentist of Groton, S. D., died from paralysis Oct. 18, 1905.

C. W. BARD, 55 years old, a dentist of Slippery Rock, Pa., died Oct. 27, 1905.

HENRY L. SHANK, 74 years old, a dentist of New Geneva, Pa., died Oct. 18, 1905.

BENTON PIPKIN, a young dentist of Lafayette, Tenn., died of typhoid fever, Oct. 5, 1905.

O. D. JONES, 60 years old, a dentist of Marquette, Mich., died suddenly Oct. 19, 1905.

JOHN S. BERRY, a dentist of Spartansburg, Ind., for twenty-nine years, died Oct. 23, 1905.

BRAINERD T. OLCOTT, 63 years old, a dentist of Boston, died at Lunenburg, Vt., Oct. 3, 1905.

ED. C. LENTZ, 34 years old, a dentist of Columbus, O., died from throat trouble Oct. 8, 1905.

GEORGE HUME STEPHENSON, a young dentist of Yates City, Ill., committed suicide Oct. 16, 1905.

ABRAM S. MILLER, 67 years old, a dentist of Lancaster, Pa., died of heart disease Oct. 12, 1905.

STEPHEN D. MCCARTHY, a dentist of So. Boston, Mass., died from typhoid-pneumonia Oct. 24, 1905.

CHARLES T. SEARLE, a dentist of California, died of typhoid fever Oct. 24, 1905, in St. Petersburg, Russia.

J. C. CHATHAM, 30 years old, a dentist of Greenwood, S. C., died suddenly from typhoid fever Oct. 15, 1905.

BALSER HUBER, 24 years old, a dentist of Warren, Ind., died Sept. 29, 1905, from appendicitis and typhoid fever.

JAMES SCOTT, 65 years old, a dentist of Portland, Ore., formerly of West Middletown, Pa., died Oct. 19, 1905.

D. R. HERTZ, 69 years old, a dentist of Ephrata, Pa., died Oct. 14, 1905, after an illness of about six months.

W. N. WILSON, formerly a dentist of Richmond, Ind., was killed by an explosion at Indianapolis, Oct. 7, 1905.

H. H. DODGE, at one time in the practice of dentistry at San Francisco, died Oct. 2, 1905, in the City of Mexico.

LEWIS P. STANBROUGH, 49 years old, a dentist of Matteawan, N. Y., for 14 years, died from appendicits Sept. 19, 1905.

DANIEL B. RAMSAY, 67 years old, a dentist of Pittsburg, Pa., died Oct. 10, 1905, after an illness lasting nearly two years.

EDWARD P. HADCOCK, 74 years old, a dentist of Newport, R. I., died Oct. 16, 1905, after a long illness from kidney and heart trouble.

ONLY ONE PLACE in the world (says *Success*) where you can live a happy life, and that is inside your income.

CASUS BELLI.—"Pat, phwat be mint by the casus belli?"

"I dunno, unless it do be the appendisaytus."—*Puck.*

DUEL OVER WOMAN.—Oct. 26 Wm. H. Wood, a dentist of New York City, fought a duel with his roommate for the affections of a woman, and escaped with practically no injury, although he shot his opponent three times.

FIRES.—Mobile Dental Parlors, Mobile, Ala., Oct. 5; loss $500, fully insured.—O. L. Braud, Thibodaux, La., Oct. 5; loss $200.—C. R. Martin, Quincy, Mass., Oct. 26; smoke and water damage.

PHYSICIAN FINED FOR PRACTISING DENTISTRY.—A physician at Tyndall, S. D., persisted in doing dental work, even though he had been warned and had no license. He was arrested Oct. 16 and fined $50.

BRIDGE ATTACHMENT.—In a bridge extending from first molar to cuspid, the molar bearing a gold crown, the cuspid was utilized without crowning as follows: A post having been inserted in the root-canal, a gold inlay

was placed in the lingual surface of the tooth, the inlay being constructed around and including the post. Demonstrated by Dr. Edna M. Thompson.—*Northwestern.*

COUNTER IRRITATION.—"I want to get copies of your paper for a week back," said the old gentleman. "Don't you think you'd better use a porous plaster," suggested the new clerk in the publication office.—*Exch.*

PEROXID AND LIMEWATER.—The dilution of peroxid with an equal volume of lime-water corrects any acid condition that may exist, retards the destructive influence of H_2O_2 on granulations, and does not detract from its efficiency.—*Forum.*

WHEN TO REGULATE.—It is asked: "What is really the best age to regulate, after eruption?" Just as soon as the crown can be gotten hold of to put an apparatus on; the age, of course, differs slightly with different individuals.—E. A. BOGUE, *Brit. Dent. Jour.*

PLATE-POLISHING COMPOUND.—To put a high polish on a plate use aqua ammonia in the chalk instead of water; the result will be found satisfactory. After polishing plate, wash it in tepid water, and dry. Then go over plate with a clean buff-wheel.—*Stomatologist.*

TRANSACTIONS OF THE FOURTH INTERNATIONAL DENTAL CONGRESS. St. Louis, Mo., 1904. Edited for the Committee of Organization by Edward C. Kirk, Wilbur F. Litch and Julio Endelman. In three volumes. Vol. I. Philadelphia: Press of the DENTAL COSMOS. 1905.

EXAMINING BOARD AFFAIRS.—At the last meeting of the Minnesota Board 8 out of 20 applicants were successful in passing the examination.—Chas. S. Stockton of Newark, whose term as a member of the New Jersey Board expired Oct. 3, was reappointed by the governor.

MEDICAL CERTIFICATE BEFORE MARRIAGE.—A Russian exchange states that the Armenian church in the Caucasus has taken the decided step that none of the clergy is allowed to perform the marriage ceremony unless the contracting parties can produce a medical certificate in regard to health.

NO MUSIC DESIRED.—Farmer Hayseed to his Congressman: "My wife wants packages of flower seeds and packages of garden seeds. Please send the same to her. Don't send her any canary seed. That might make her want to sing, and the Lord knows I have trouble enough with her now on that score."

FORMALDEHYD.—In cases where the crown portion of the pulp is dead but that in the roots highly sensitive, forty per cent formaldehyd with a little cocain added will often bring about most happy results. In cases of the most aggravated toothache the pain will be overcome in a very few minutes.—E. H. EWALD, *Summary.*

ROUGHEN THE MARGINS.—Some operators trim the cavo-surface angle with a gem stone and then finish it with sandpaper disks. Tight margins cannot under any circumstances be made against a smooth margin if gold is the filling material used. Gold slides over a polished surface, for there is nothing against which it can be restrained in its course. But roughen that mar-

gin by planing it with a sharp chisel, and gold will hug that roughened surface, if properly placed, so that water-tight margins can be made.—E. K. WEDELSTAEDT, *International.*

BUT.—Horses are immune against antimony, dogs against mercury, goats against tobacco, mice against hemlocks, rabbits against belladonna, dogs against arsenic. Query—If a man is immune against tobacco, is he then to be classed among the goats? And has this any bearing on his post mortal destination?—*Alk. Clinic.*

WIRE RUBBER-DAM LIGATURES.—To force the dam and gum out of cavities extending deeply under the gum, not always successfully accomplished by the ordinary clamps, try using a fine soft wire, doubled and tightly twisted, as a ligature. Wax the wire to make the dam stick to it. Force dam and wire above cavity margin with a small chisel.—WM. MITCHELL, *Items.*

SHORT RULE FOR DETERMINING PER CENTS IN MIXTURES.—A. C. Hewett, in *Review.* Multiply 480 by the per cent desired and point off two right-hand figures. The figures at the left of separatrix will give the number of grains or drops; 480 is number of grains to the ounce. Examples: 480× 4 = 1920; 19.20 = 19 1-5; 19 1-5 grains to an ounce of liquid, or 4 per cent solution. 480 × 10 = 48.00, or 48 grains to one ounce—10 per cent.

STUNG.—"Ever been stabbed in the back by a professional man, Doctor?"

"Many times."

"By an ethical or unethical man?"

"Ethical, every time, and in the greater number of instances by a member of my own society."—*D. O. & Lab.*

ATTACHING MODELS TO AN ARTICULATOR.—F. A. Graham in *Review.* By roughening the bases of the dry models they can be attached to the articulator in a moment by means of sealing wax. The cheap kind sold at the grocer's answers perfectly. Soak the models when ready to remove. An old glove may prevent a burn on your fingers, as sealing wax is a rather powerful stimulant.

HYPERSENSITIVE DENTIN.—Hypersensitiveness of dentin is the result of pericemental irritation far more than of pulp irritation. The pericemental life of the tooth is markedly influenced by the irritative infection found always at the necks of untreated teeth. Removal of this infection is the removal of much of the cause of the undue sensitiveness of dental tissue.—D. D. SMITH, *Dominion.*

FATALITIES.—Oct. 19 a woman, aged 58, at Kokomo, Ind., died from blood-poisoning. A poorly-finished vulcanite plate caused soreness and irritation, which finally resulted fatally.—Oct. 7 a man at Maxville, O., dropped dead in the office of a dentist to whom he had gone to have some teeth extracted.—Oct. 4 a man at Warren, R. I., 46 years old, was complaining of toothache and left home to visit a dentist. He returned soon afterwards and seemed to be in more pain than before. A few minutes later he dropped dead. There were no evidences of a tooth having been extracted immediately before, so death was probably caused by heart

failure.—Oct. 14 a nine-year-old girl at Providence, R. I., died in a dental chair from paralysis of the heart after chloroform had been administered and a tooth had been extracted.

Cocain Solutions.—The toxic effects of cocain depend not only on the quantity of the alkaloid injected, but likewise and to a great extent upon the strength of the solution. Reclus, starting with a 20 per cent solution, has gradually decreased the percentage until at the present time he employs solutions of from ½ to 1 per cent, the maximum, with results all that could be desired.—J. E., *Cosmos.*

Ptyalism.—The *Medical Press* recommends the following:

℞—Tinct. myrrhæ,	℥iij;
Potass. chloratis,	℥ss;
Sodii chloridi,	℥ij;
Aquæ dist.,	q.s. ad ℥viij. M.

Sig.—Use as a mouth-wash. Repeat every two hours.

Waiting.—"What profession do you follow?" asked attorney for plaintiff.

"The medical profession," the witness answered.

"Are you a practicing physician?"

"No, sir."

"Then what do you mean by saying you follow the medical profession?"

"I am an undertaker, sir."—*Chicago Journal.*

Tooth-Staining.—The trade of tooth-stainer, followed in Eastern Asia, is as odd a calling as any (says the *Brit. Jour. Dent. Sc.*). The natives prefer black teeth to the whiter kind, and the tooth-stainer, with a little box of brushes and coloring matter, calls on his customers and stains their teeth. The process is not unlike that of blacking a boot, for a fine polish is given to the teeth. The pigment used is quite harmless.

Bridgework—the Abutments.—A favorite form of abutment with me is to place an iridio-platinum post in the enlarged pulp-chamber of any of the six anterior teeth and then back up the tooth after the manner of backing a facing; trim this to the proper shape and flow solder over the surface, making the backing and the post continuous. This is a concealed yet very strong form of abutment.—Edw. Eggleston, *Summary.*

To Stop Mouth-Breathing.—M. in *Review.* Take an impression of the labial and buccal surfaces of the teeth and gums with the teeth closed in their proper relation. Make a plaster model and fill in so that you have conformity of the arches. Take Hercules rubber and make guard to fit labial and buccal outline of arches. This is to be worn in the mouth over night, with a chin and skull cap in position to keep the jaws together.

Woman Lands on Painless Dentist.—Oct. 18 a woman in Brooklyn was suffering from an aching molar, so she went out looking for relief. A big sign advertising the absolutely painless extraction of teeth attracted her and she went into the dental parlor. The proprietor made several efforts to remove the tooth, but his efforts were futile and anything but painless. Finally the woman could stand the torture of his work no longer,

so she jumped from the chair and landed a hard clean-cut blow on his chin. The dentist called a policeman, and both were taken to the station, but the magistrate dismissed the case.

Good Coating for Plaster Casts.—To four ounces of sulphuric ether add two ounces of collodion and two ounces of "silver gloss." The latter may be obtained from dealers in painters' supplies and is put up in one-ounce packages. Let the mixture stand for about 48 hours, and shake well before using. Apply with a camelshair brush and keep in a well-corked bottle. This will give a beautiful glossy surface to casts.—Dr. J. F. Steele, *Dental Hints.*

Both Coming and Going.—"What's that noise?" asked the visitor in the apartment house.

"Probably someone in the dentist's rooms on the floor below getting a tooth out," said the host.

"But it seems to come from the floor above."

"Ah, then it's probably the Popleys' baby getting a tooth in."—*Philadelphia Press.*

Removal of Vulcanite from Porcelain Teeth.—Cover the bottom of an iron ladle, such as used for melting lead or zinc, with a layer of dry plaster of Paris; lay the teeth to be cleaned on the surface and sprinkle dry plaster over, completely covering them; place over a big Bunsen flame in draught chamber or in coke furnace, and heat to redness. Then cool down gradually, when on removal the teeth should be found perfectly clean.—W. T. Finlayson, *Record.*

Pulp-Canal Treatment.—My final treatment of pulp-canals is as follows: The canal is flushed with campho-phenique in which thymol has been dissolved in the proportion of forty grains to the ounce. A gutta-percha point, fastened to the end of the root-plugger by heating the point and pressing it gently to the large end of the cone, is dipped into campho-phenique and then into iodoform powder, and forced to place in the canal.—J. Leon Williams, *Cosmos.*

Spittoons in Public Places at Buenos Ayres.—The regulations at Buenos Ayres call for spittoons mounted on standards or fastened in the wall at a certain height from the floor, in all schools, colleges, theaters or other public places, the number proportional to the attendance. They must each contain water or some disinfectant. Above every cuspidor is a placard with the words: "Hygienic cuspidor. For reasons of public health it is forbidden to spit on the floor."

Hypersensitive Dentin.—The long list of physical and pharmaceutical remedies recommended for dental hyperesthesia we all know frequently fail in acute cases. Refrigeration with ethyl chlorid is the most active remedy, but it has the great disadvantage of its volatility and the painfulness of its application, insupportable by some patients. Hot carbolic acid, recommended by Dr. Jenkins, although very efficacious in mild cases, is not sufficient in acute hyperesthesia. It is then that nervocidin will surprise us by its effects,

for the application of this drug will, without destroying the vitality of the pulp, suppress in a few hours all sensitivity during the excavating.—F. AGUILAR, *Gazette.*

CRACKS IN THE ENAMEL.—After inserting, as we thought, a perfect gold filling, a suspicious-looking crack may suddenly appear in the enamel. This is due to the expansion of the gold in response to the heat engendered in polishing the filling; in other words, the expanding plug of gold has burst the unyielding walls of the cavity, and so surely as the gold will contract again on cooling, so surely must it leave a space between itself and the walls of the cavity.—C. E. BROWN, *Record.*

BONE ABSORPTION AROUND ROOT APEX.—The nature of the absorption can to some extent be determined by the nature of the discharge. If it is thin, watery, yellowish, with little granules of bone mixed in, you can be pretty certain that caries of bone exists; if thick, rich pus, simple absorption; if it is yellow, streaked with blood, no granules, you can count on a roughened root-end, which should be confirmed by exploring through the external opening.—ELGIN MAWHINNEY, *Review.*

EXTRACTION FOR THE CURE OF ABSCESS.—"What is our business in life? To take out an inefficient organ which is suffering for a moment with a passing disease? An abscessed tooth is very easily curable; then why should we extract it? The extraction of teeth, it seems to me, is the practice of the inefficient man. The curing of an abscess is an extremely simple thing in almost every case and the preservation of an abscessed tooth is the simple duty of the accomplished dentist.—N. S. JENKINS, *Items.*

FIRM STAND.—The mild business man was calmly reading his paper in the crowded trolley-car. In front of him stood a little woman hanging by a strap. Her arm was being slowly torn out of her body, her eyes were flashing at him, but she constrained herself to silence.

Finally, after he had endured it for twenty minutes, he touched her arm and said:

"Madame, you are standing on my foot."

"Oh, am I?" she savagely retorted; "I thought it was a valise."—*Lippincott's Magazine.*

ROBBERIES.—Dr. Pratt, Winterset, Ia., Oct. 6; $100 worth of gold.—H. V. McGregor, Atlantic, Ia., Oct. 12; $50.—W. H. Dwight, LeMars, Ia., Oct. 5; $25.—Dr. Woodruff, Columbus Jct., Ia., Oct. 11; $35.—Louis Kraft, Edwardsville, Ill., Oct. 4; $30.—Albert G. Mann, Taunton, Mass., Sept. 29; $10.—Newton Morgan, Springfield, Mass., Oct. 10; $60.—R. A. Gemmill, B. Bements and C. H. Sharps, Lockport, N. Y., Oct. 22; $25 worth of gold, two sets of teeth, office entered, but nothing found missing, are the respective reports.—C. A. Warner, N. Tonawanda, N. Y., Oct. 21; $10.—D. E. Moonsheimer, Oct. 21; $40.—Weston A. Price and John M. Yahres, Cleveland, Oct. 2, total loss $75.—J. H. Christ, Chester, Pa., Oct. 19; $50.—Albany Dentists, Harrisburg, Pa., Oct. 5; $53.—Frank H. Whitehouse, Providence, R. I., Oct. 1; $30.—B. F. Gilmer, Denison, Tex., Oct. 6; small amount of

gold.—Heywood & Foutz, Chattanooga, Tenn.; set of false teeth. The robber, a negro, was caught and sentenced to the penitentiary for a term of five years.

REMEDY FOR MAL DE MER.—"I have sailed the seas for half a century, gentlemen," said Captain Cochrane to a group upon the deck of his ship. "When any of you begin to feel qualmish, come to me. I will give you the best remedy I know of."

"What is it?" asked two or three hesitatingly.

"A mint julep."

"Why?" asked the others restlessly.

"Because it tastes just as good coming up as it does going down."

DENTAL DECAY.—Miller says there are four ways in which we can counteract or limit the ravages of dental decay. First, by hygienic measures to secure the best possible development of teeth; second, by repeated, though systematic, cleansing of the oral cavity and the teeth; third, by prohibiting or limiting the consumption of such food and luxuries as rapidly undergo acid fermentation; fourth, by the proper and intelligent use of antiseptics to destroy the bacteria, or at least to limit their number and activity.—H. C. REGISTER, *Items.*

DORMANT ABSCESS.—Apply the dam, thoroughly sterilize the field, remove as much caries as possible without opening into the chamber (or if in cavity, drill as far into the dentin as safe, without reaching the chamber), and seal in a paste of paraform, oil of cloves, and trikresol; leave it from two to four days. This will pentrate through the tubuli and disinfect well up into the root, so that at the next sitting the chamber can be opened and treatment proceeded with without danger of stirring up a hornet's nest.—ELGIN MAWHINNEY, *Review.*

SAUCE FOR THE GOOSE.—A doctor finds it difficult sometimes to secure for his patient the quiet necessary for his recovery. One, however, was equal to the emergency. The fussy, worrying wife of a man who was ill came up to him as he was leaving the house.

"Oh, doctor, how is he? How is he today?" "Above everything, he must positively have quiet, so I have written out a prescription here for a couple of opium powders," replied the doctor.

"When shall he take them? When shall I give them to him?"

"Him?" said the doctor. "I've prescribed them for you."

ACCIDENTS.—D. A. B. Wallace, a dentist of Youngstown, O., was painfully burned Oct. 1 by the explosion of some acid in which he was purifying some gold.—Oct. 16 a man at Standish, Mich., swallowed a plate carrying three false teeth, which lodged in the pharynx. He was nearly dead when physicians succeeded in recovering the plate.—Harry Richards, a dentist of Rockland, Me., was painfully burned on Oct. 19, when he bathed one of his eyes by mistake with sulphuric acid instead of witch hazel, but it is thought the sight of the eye can be saved.—Oct. 20 T. C. White, a dentist of Cambridge, O., was found by two patients in the morning leaning against the wall and in an unconscious condition. He was holding the

handpiece of his electric engine, and in some way was almost electrocuted, not regaining consciousness for several hours. The hand holding the instrument and the right foot were painfully burned, and the right shoe was burned to a crisp.

DIVORCES.—S. H. B. Cochrane, a dentist of Columbus, O., filed suit for divorce against his wife Oct. 18.—Mrs. E. Hyde was granted a divorce on Oct. 30 from her husband, Edwin Hyde, a dentist of Los Angeles, on the ground of desertion, but there were alleged to be other and more serious causes for her making application.—Emma C. Hill on Oct. 17 brought suit for divorce against her husband, Elmer E. Hill, a dentist of Palmer, Mass., and formerly of Springfield, Mass., alleging that he is a confirmed user of drugs.—Alberta McConnell on Oct. 6 filed suit against her husband, Thos. C. McConnell, a dentist of Pittsburg, alleging unfaithfulness.

ANTIDOTE FOR CARBOLIC ACID POISONING.—Some time ago a veterinary surgeon of Dublin accidentally discovered (*Medical Age*) that turpentine, when taken in poisonous doses, is an antidote to carbolic acid. He was called upon to treat two horses that had been poisoned, and gave one of them what he thought was olive oil, but which was really turpentine. The benefit was so great that he gave some to the second horse. Both recovered rapidly, although the second horse was already unconscious when the dose was administered. As we have at the present time no very efficacious treatment for this form of poisoning—which is a favorite method of many would-be suicides—it might be well worth trying to prove its value.

BURNING FROM X RAYS.—Mr. H. Lyle, Senior Surgeon to the Liverpool Hospital for Cancer and Skin Diseases, in a letter to the *Lancet*, states that burns caused by the X rays, which are generally found to be so intractable, are readily cured by the following ointment, the dermatitis soon disappearing:

R—Plumb. oxid.,	℥j;
Zinc. carb.,	℥ij;
Glycerin,	℥j;
Ol. oliv.,	℥ss;
Adeps benzoat.,	ad ℥j.
M. ft. ung.	

Sig.—To be applied freely.

PREPARING AND FILLING CAVITIES IN PORCELAIN TEETH.—It takes but a few minutes to prepare a cavity. Much better results can be obtained by the use of a thin diamond disk than with the diamond-point drill. By using the disk cavities may be made in almost any part of the tooth in which the natural ones usually decay. First cut away with a corundum or carborundum stone the surface of the tooth where the filling is to be placed, and then with the diamond disk the sides of the cavity can be easily undercut sufficiently to hold the filling. Some form of sponge gold is much easier started than foil, and can be worked with very little malleting. It requires only about half the quantity of gold necessary to fill the ones prepared with the drill. Approximal cavities can easily be imitated by this method, which would be

impossible in the old way; corners can be built out and a filling can be inserted in almost any position desired. With a little experimenting one will be surprised at the artistic results which may be obtained, and I am sure your patients will fully appreciate your efforts in this direction.—D. LINLEY PALMER, *Brief.*

ANCIENT MEDICAL LITERATURE.—The oldest medical works in existence are those of the Chinese, and date back to nearly 3,000 years B. C. Then, as now, they divided their subjects under the captions of healing, cooling, refreshing, and temperate. They have everything divided into classes, and their prescriptions are classified under seven headings, as follows: (1) The great prescription. (2) The little prescription. (3) The slow prescription. (4) The quick prescription. (5) The odd prescription. (6) The even prescription. (7) The double prescription. These are applied under four special circumstances and conditions, which in their turn are classified. Fire is an agent in which they have great faith, as also they have in mineral waters.—*Medical Times.*

TAKE CARE OF YOUR EYES.—M. L. Hanaford in *Review.* I had an experience recently, the relation of which may be of benefit to other workers in porcelain. Shortly after using the electric oven there came on an acute inflammation of the retina, manifested by partial loss of vision, flashes of light as of sparks of electricity, etc. An immediate visit to an oculist served to allay present fear, and in the course of an hour or two sight was again normal. The oculist stated that diseases of the retina are common among those who habitually expose their eyes to intense light, such as dentists confront in the electric oven and when fusing platinum solder. The remedy is to use smoked glasses when soldering platinum and baking porcelain, and the duty to take this precaution should be considered imperative by every dentist who values his eyesight.

SERIALLY.—A very small girl in a Harlem apartment was observed by a friend of the family eating a certain cereal preparation. She seemed to eat, as the English are said to take their pleasures, sadly.

"Don't you like that, my dear?" inquired the friend.

"Not partic'ly," replied the little maid.

"Why do you eat it, then?" persisted the inquirer.

The daughter of the house paused with the spoon on the edge of the bowl.

"It's got to be eaten," she answered gravely. "The groceryman gives mamma a rag doll for every two packages she buys, and it's got to be eaten every morning."

And she continued to eat cereal.—*Christian Endeavor World.*

ALUMINUM.—Aluminum is in many ways a wonderful substance, albeit in the natural world most of it is oxidized and turned to clay. Its avidity for oxygen is one of its most salient characteristics. It is said that we never see the metal directly in air, but always and only through a veil of superficial oxid, which forms on its free surface with marvelous rapidity. It is stated that if a fresh surface of aluminum be prepared by scraping with a knife, the

oxygen of the air runs in as fast as the scale is peeled off and keeps close behind the knife blade. It it were not for this superficial scale of oxid, which acts as a barrier to further action, the metal would burn up in the air. The large amount of heat developed by thermit, a mixture of powdered aluminum with oxygen-giving substances, bears witness to the activity of the oxidizing process when completed.—*Electrical World and Engineer.*

"BURST, SPLINTERED, AND DESTROYED."—Frances H. Maloney, in a suit filed yesterday (says the *Louisville (Ky.) Journal*), charges that Dr. F. C. Kenney, while extracting her upper row of teeth for the purpose of substituting false ones, "burst, splintered, and destroyed a portion of the alveolar process in the superior or upper arch of her mouth on the right side, extending from the central tooth to the cuspid tooth, and then from the cuspid tooth back past the bicuspid teeth." She says that this accident was the result of carelessness on the part of the defendant and that it caused her great suffering. It is averred that pieces of bone were thus forced through her upper gum, and that she was compelled to undergo a painful and costly operation to have them removed. The plaintiff asks that Dr. Kenney be required to pay her five thousand dollars damages.

PHYSICIANS SHOULD EXAMINE TEETH.—No physician at the present time (says the *Medical News*) should ever treat a patient complaining of symptoms of indigestion without a thorough examination of the teeth. If those present are insufficient for proper mastication, or if there are carious teeth the patient should at once be recommended to consult a good dentist. It is not, however, sufficient simply to suggest any dentist, but the patient should be given a good idea of the risk involved in consulting anyone but some member of the dental profession who is thoroughly responsible and whose skill can be relied on to do what is best for the patient. There is no doubt that physicians can in this way contribute in an important degree to the uplifting of the sister profession of dentistry, and enable it to escape some of the demoralization incident to the large number of bargain-counter dentists in the field.

NEED OF PHYSICAL EXERCISE.—Erasistratus (says the *N. Y. Med. Times*), one of the most famous physicians and anatomists of antiquity, believed and taught that exercise "is not particularly indicated for the preservation of the health." Since his time many wise and thoughtful persons have held the same opinion, which, indeed, is now regarded as correct by the best authorities. This does not mean that a person of plethoric habit can gratify his eating and drinking propensities to the full, and yet remain healthy though avoiding every bodily exeretion not absolutely necessary. It merely implies that exercise, in and by itself, is not a salutary practice, nor one to be relied upon for warding off the consequences of over-indulgence. As an eminent physiologist and hygienist expresses it: "If a man persistently overfills his blood and connective tissue with materials ingested greatly in excess of his requirements, exercise, especially if spasmodic and violent, and taken at irregular intervals, is likely to do him more harm than good." Even among people of temperate habits the mistake

is frequently made of seizing opportunities of leisure from monotonous work to do a sudden spurt of other and unaccustomed work, under the false impression that it will do them good. The chances are that they need rest a great deal more than they need exercise. To people who live in cities the drain of normal life upon the physical and mental energies is all that they are usually able to resist. Exercise for its own sake should not be taken when it induces fatigue. It should not ordinarily be prolonged after it has started sensible perspiration, unless one is prepared for a bath and a change of underclothing at its termination. With moderation in eating and drinking, and zeal in the performance of the duties of life, moderation in exercise will commend itself to the sane man as much better than overexertion.

To Remove Rust from Instruments.—The instruments are placed over night (*Pharmaceutisches Zentralblatt*) in a saturated solution of stannous chlorid, which causes the spots to disappear by reduction. The articles are then rinsed in water, laid in a hot solution of soda soap, and dried. It is well to rub them with absolute alcohol and prepared chalk. Another convenient method for removing rust is to lay the instruments in kerosene. Paraffin oil is the best preservative against rust, and the most convenient way of applying it without getting an unnecessarily thick coating is as follows: One part of the oil is dissolved in 200 parts of benzine, and the objects, after being thoroughly dried and warmed, are plunged into the solution. Instruments with joints, as scissors or needle-holders, are worked in the fluid, so as to cause it to penetrate into all crevices, and the benzine is then allowed to evaporate in a dry room.

Pearl in a Tooth.—"I ask you, how could I help it?" was all Alphonse Ducroit's defense (*Chicago Tribune*) when called on in a Paris court to explain why he had played a new trick on a poor dentist. "It was so easy; he bit like a pawnbroker." Here is what he did. The dentist, Hugues Holer, was eating his lunch when a patient called with, according to the servant, such a terrible toothache that human pity could not resist. The dentist left his chops and put the man in a chair. He found a hard substance in one of the teeth in the back of the jaw which looked like a metal filling ready to come out. He touched it lightly with his instrument and the next instant had a good-sized pearl in his hand. "Sapristi! but it's a pearl! Who's put a pearl in your tooth?" Ducroit, for it was he, explained in a mystified way that he had indeed been eating oysters a moment before, and had thought he had broken a tooth by biting on a piece of shell. He at first seemed delighted and discussed with the astonished dentist the probable value of the gem. Then: "I am sorry I have no money to pay you with; I went off in such a hurry that I did not pick up my pocketbook."

"O, that's all right," said the dentist, "you can—"

"Tiens! Here's an idea," said Ducroit suddenly. "You keep the pearl till I come to-morrow, and, for form's sake, you might let me have fifty francs as pledge of fair dealing."

The dentist thought that was all right, too. He gave Ducroit the fifty and

put the pearl away. Next day, when the lucky owner did not come back, he thought he would take a look at it. The microscope showed it a vulgar imitation that, said the magistrate, ought not to have taken in a baby.

Ducroit was found having a great time with the last louis of his ill-gotten money. "It was only the eighth time I'd played that trick!" he declared sorrowfully. "There should have been 500 francs more in it. Brains don't bring the reward they used to, mes enfants!"

THE DOCTOR.—Who mixes many a bitter pill,
Who deals a dose that's fit to kill,
A-body takes against his will?
The doctor.

Who oft assumes a busy frown,
And drives his buggy up and down,
Without a patient in the town?
The doctor.

Who draws from an exhaustless store
Strange terms a rod in length, or more,
With which to barricade Death's door?
The doctor.

And who assumes a knowing air,
When puzzled, baffled, in despair,
And leave's the sick to Nature's care?
The doctor.—DR. C. E. MELROY, *Alk. Clinic.*

MARRIAGES.—Harry B. Anderson, a dentist of Ellwood City, Pa., was married to Miss Jennie Burnett of Pittsburg, Oct. 18.—M. W. Barr, a dentist of Big Timber, Mont., was married to Miss Emma Stubblefield of Big Timber, Sept. 26.—Dea M. Bass, a dentist of Portage, Wis, was married to Miss Harriet E. Purdy of Portage, Oct. 15.—Fred S. Blackmar, a dentist of Champaign, Ill., was married to Miss Leta M. Peterson of Allen, Mich., Sept. 19.—J. A. Case, a dentist of St. Louis, was married to Miss Maude Magner of St. Louis, Oct. 30.—Arthur H. Fleming, a dentist of Spartansburg, S. C., was married to Miss Helen H. Williams of Louisburg, N. C., Oct. 17.—Arthur O. Glass, a dentist of Lowell, O., was married to Miss Edith Shoop of Beverly, Oct. 12.—John T. Hinch, a dentist of Bar Harbor, Me., was married to Mrs. Alice Foster of Bar Harbor, Sept. 12.—C. A. Kitchen, a dentist of Rockford, Ill., was married to Miss Ella Osborn, a dentist of Los Angeles, Cal., Oct. 10.—Henry Merrill, a dentist of Somerville, Mass., was married to Miss Lottie Gordon of North Cambridge, Oct. 14.—Edwin A. Morrow, a dentist of Washington, Ill., was married to Miss Ethel Cress of Washington, Oct. 19—Earl S. Packwood, a dentist of Buffalo, N. Y., was married to Miss Ethel Jones of Buffalo, Oct. 4.—Charles F. Port, a dentist of Clinton, Ia., was married to Miss Bessie Reppy of Clinton, Oct. 4.—Aubrey A. Posey, a

dentist of Faulkner, Md., was married to Miss Katherine E. Howard of La Plata, Oct. 4.—Thomas J. Ryan, a dentist of New York City, was married to Miss Frances Ryder of Brooklyn, Oct. 11.—Lyman Sexsmith, a dentist of Chicago, was married to Miss Charlotte Wells of Stevens Point, Wis., Oct. 11.—Albert Sohm, a dentist of Quincy, Ill., was married to Miss Lyda Troja of Ft. Madison, Ia., Oct 18.—Carter Sprinkel, a dentist of Harrisonburg, Va., was married to Miss Bertie Woods of Mt. Jackson, Oct. 2.—Charles M. Trotter, a dentist of N. Salem, Ind., was married to Miss Beulah Adams of N. Salem, Oct. 19.—Fillmore White, a dentist of San Francisco, Cal., was married to Miss Helen Brune of San Francisco, Oct. 23,—F. S. Waite, a dentist of West Salem, Wis., was married to Miss Carrie Aldrich of West Salem, Oct. 11.

Rationale of the Cold.—The rationale of the causation of the ordinary "cold" is pretty well understood (*Medical Record*) at the present day, and it is generally conceded that when circulatory disturbances or vital depression are produced, as the result of localized or general chilling of the body surface, newly entered or already present pathogenic bacteria are enabled to attack the body, with very good chances of success. At such times it is said that the powers of resistance are below par, and consequently the bacteria gain an easy victory. This point was illustrated in telling fashion by Durck, who found that rabbits infected with pneumococci developed pneumonia if they were subjected to severe cold, whereas unchilled control animals survived. The mechanism of this weakening of the vital forces has not been satisfactorily explained however, and considerable interest therefore attaches to experimental work on the subject recently done by Franz Nagelschmidt. He contributes to the recent Senator Festschrift a description of his studies on the hemolytic and bactericidal power of the blood after the animal has been exposed to cold. Rabbits and goats were used, and the activity of the anti-bodies of the serum was tested before and after immersion of the whole animal, or portions of its body, in ice water for varying lengths of time. The results obtained showed some curious inconsistencies that still demand explanation, but in general it may be said that by chilling the surface it is possible to reduce the number of the anti-bodies in the blood to a very marked degree. This means that the body is deprived of a goodly proportion of its defensive weapons, and therefore under such conditions it easily falls a prey to infections of all sorts. The effect of cold in bringing on attacks of paroxysmal hemoglobinuria is well known, and it may be that this obscure condition will be illuminated by further developments along the same line of investigation. A point of practical importance is the fact that it was found that repeated exposure to slight degrees of cold brought about an increase of anti-bodies, and this observation therefore affords a theoretical justification of the practically approved methods of "hardening" the body by hydrotherapeutic and other methods of training. Such procedures should not only serve to protect against colds and allied conditions, but also should render the body better able to cope with bacterial and other noxa of all kinds.